

A
REPORT

ON

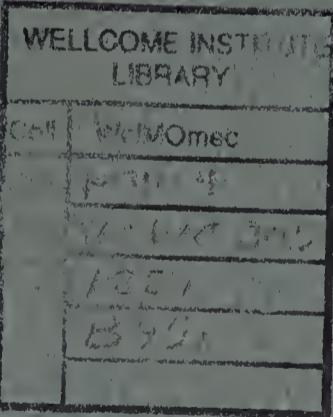
REMITTENT ANTHRAX;

BY

VETERINARY SURGEON.

R. W. BURKE, A. V. D.

1887.



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CANCELLED

REMITTENT ANTHRAX.

In accordance with the Adjutant General's telegram, dated, Simla, 16th December, 1886, I left Cawnpore for Meerut on the night of the 19th idem, and after seeing the Inspecting Veterinary Surgeon on my arrival the following day, and being shown round the cases by V. S. (First Class) C. Clayton, A. V. D., began to study the clinical characteristics of a disease which had prevailed in Meerut with undiminished severity since August last. I may mention that I had already examined, previous to my arrival in Meerut, the blood of patients which was forwarded for my opinion from time to time, and pronounced the disease to be anthrax, an opinion I was afterwards able to corroborate with the progress of my inquiries made on the spot. My stay in Meerut was a little over 5 weeks. I beg to submit herewith a report of my investigations into the nature of the disease, considered under the following headings :

SYMPTOMS.

Symptoms

... There is always some difficulty in fixing the period of first attack, as animals affected with this disease are seldom noticed ill until the eyes appear dull, with drooping of the eye-lids, and petechial spots on the membrana nictitans. In many cases there is a blue colouration of the conjunctiva (cyanosis). If the temperature be now taken, fever is detected. In a few cases shivering fits are remarked at the onset, and the breathing is noticed to be slightly hurried. The shivering may recur in some, though not in all cases, during the course of the disease. In many others in which it was not recorded, I believe it escaped observation. In others again in which it was absent during the early stages, it was sometimes noticed later on. This symptom is, therefore, not of practical value, when we consider the difficulties attending its detection in our animals. The temperature is found to be 102° F., if taken at the onset, and rises to 105°, 106° F., or even higher. It descends in a few hours to 102° F., and may even come down to normal point, *with complete cessation of all febrile symptoms*. The cases linger to several days, and show an apparent improvement, but again manifest acute symptoms, due either to a fresh attack, or, as I think is more likely, to some complication. Usually, the temperature remains at 102° F., or a steady tendency to normal temperature is maintained. Still, the animal does not improve, and the majority of them never do completely rally, being destroyed by order, or succumbing to weakness. Occasionally death results earlier in the course of the disease, during an exacerbation. Frequently there is no regularity in the rise and fall of temperature, and the fever often assumes a remittent type. The temperature sometimes falls below normal point. *There is a morning remission noted in most cases.* In some death follows in a few hours, the animal never having shown any signs of previous illness, but especially towards the early part of the outbreak, as shown by the reports of different Veterinary Surgeons. In other cases, a sustained high temperature is noticed for four or five days, or more, followed by death. Swellings, due to serous effusion into the subcutaneous tissue, sometimes appear in the course of the disease, but especially under the arms, throat, and abdomen, between the thighs, and in connection with the sheath and scrotum—the scrotum is sometimes enormously enlarged. Thirst is present in some cases, attended with diarrhoea. Veterinary Surgeon Ringe saw a case in which persistent vomition was noted. Paraplegia, pronounced stringhalt, muscular tremors, platting of the legs, &c., develop during the course of the disease, due to effusion on the spine and on individual nerves. These symptoms are seldom permanent in character, and often disappear on removal of the effused fluid due to natural absorption. They may, therefore, be regarded as complications of this disease. Judging from the other symptoms taken in connection, it is not improbable that paraplegia is but a modification of the paralytic form of anthrax well known to veterinarians in India. V. S. (First Class) B. Glover, A. V. D., described to

me a case in a stallion belonging to the Horse-Breeding Department, which occurred in this district only the other day, where the animal's tongue hung some inches outside the mouth from swelling (gloss-anthrax); post mortem examination revealed the usual lesions of anthrax, such as have always appeared in my own cases. The rapidity with which the animals lose flesh in this disease is also characteristic of anthrax, and was well marked in several cases which came under observation, but in none so clearly as in the case of a grasscutter's pony which was found in apparently perfect health and condition at 10.30 A.M. on the 30th December, and had suddenly fallen away by 3 o'clock of the same afternoon, to the state seen in the accompanying photograph, taken next morning. In a series of more than a hundred temperature charts kept by Messrs. Clayton, Philips, Nuthall, Walker, Ewing, Pease and others, no relapses have been generally found associated with the fever common to this disease. I have attached a few only, out of many charts kept by myself, and others furnished on request by V. S. Nuthall, which were taken at random from among several cases belonging to the 8th Hussars and 19th Bengal Lancers respectively, and which may prove of interest in this connection.

COURSE.

Course

The course of the disease is not so rapid as in some other forms of anthrax, the animals revive after an attack, and a few days after a relapse occurs, which leaves them so weak that they seldom rally, ultimately succumbing to exhaustion. In these terms Röll has described a form of anthrax which is noticed on the continent of Europe. (*Lehrbuch der Pathologie und Therapie für Thierärzte*, 1885). Bollinger also records cases of intermittent anthrax in cattle, in which after each attack the animal appeared in perfect health. And Veterinary Surgeon Bowhill's observations on anthrax in cattle, may be read with interest in this connection, as showing the characters now and then assumed by this disease in America also. (*Veterinary Journal*, December, 1886, p. 418.)

The course and symptoms of the disease are not such as we have been accustomed to meet with during outbreaks of anthrax in India before; but this should not dampen interest in the subject, and search after truth, whether it be found in accordance with our preconceived ideas or otherwise. The similarity of the symptoms and course observed in the last outbreak among horses and ponies, to those found in remittent fever of man, in so far as I can judge from its literature, and the fact of their being indistinguishable from that form of anthrax known on the continent of Europe as Intermittent Anthrax—which may easily assume a remittent type in hot climates—is strong evidence in favour of my belief that the diseases we have studied bear a very near relation to each other, if they are not identical.

Mr. Oliphant, Principal Veterinary Surgeon in India, referring to the Meerut outbreak, in his letter dated 28th December, 1886, says,—“One of the principal reasons for considering it *not* anthrax, has been, I understand, that it has not been *rapidly* fatal. But, I believe it has followed exactly the same course as anthrax in all outbreaks, in which careful observations have been made. Numerous other cases of a prolonged type have always followed.” For this distinction we can refer to experiments made on animals, as well as to cases of daily observation. Those conclusions that are based on the observations of rapidly fatal cases *only*, are evidently based on the assumption that the tissues of every animal are absolutely identical. That, however, is not the case. There are some animals which will take the disease in a very virulent type, and die rapidly, whilst in other animals the same micro-organisms will prove relatively innocuous, or produce only a very mild attack, characterised by a prolonged course. It is the same with other diseases; each animal has its own idiosyncrasies for nourishing and for starving micro-organisms, since every nutrient soil is not equally adapted to the same microzoon. But not only is the difference of the same tissue in different animals the reason of a different behaviour of the same microzoon, the tissue itself in one and the same animal may change under different conditions. It is possible that changes may take place in the system of the animal, unknown perhaps to ourselves, but very important to the respective micro-organisms. I will only allude to ‘vaccination’ as a preventive of disease, which evidently changes the nutrient soil, so that the microzoa of that particular disease can no longer find nourishment, and the vaccinated animals remain unaltered by an injection which would have proved rapidly fatal if non-vaccinated. It is further ascertained, as a matter of observation, that certain micro-organisms cannot thrive

well, or do so very imperfectly in one body under certain conditions, whereas they may be pernicious when certain other conditions are present. (Emmerich, *Tageblatt d. 59, Versammlung Deutscher Naturforscher und Aerzte 18 bis.*, 24 September, 1886, p. 145). May not this consideration explain why in one animal the microbes of anthrax produce an acute attack, whilst in another they do not? It is known that, not only in an animal's body, but cultivated in artificial media, bacteria may retain their properties unaltered, or they may undergo more or less modification.

If it is true that not every nutrient soil is equally well adapted to a certain microzoon, that microzoon developing better in one constitution than in another, it must consequently be true, that one microzoon may be so changed that it may occasionally show some difference, according to its surrounding conditions, in its mode of growth and other peculiarities, to such an extent that its pathogenic activity might be lessened or strengthened according to those conditions. This idea is in accordance with what daily experience teaches with respect to plants and animals. Plants put in a convenient soil may grow extremely well, and may, to a certain extent, change their colour, smell and other qualities, but put in a bad and inconvenient soil, they will not thrive, or but only imperfectly.

The P. V. S. in India observes,—“I have always been anxious to discover from the charts, whether there is a ‘periodicity’ in the temperature of anthrax. There is no doubt that the bacilli appear in crops, appearing and disappearing at varying intervals, and I believe they hold possession of the system, probably in the shape of spores, for very long periods. We have a horse here which has gone through three attacks of anthrax, and shows now periodical crops of petechiae on the mucous lining of the eye-lids, &c.”—an opinion I can fully endorse from my experience of anthrax in camels also, which I reported officially during 1885-6.

The difficulty which must at first strike every one in regard to the action of these microzoa on the bodies of animals is the comparative rarity of acute symptoms in so many cases. The explanation which on many grounds has recommended itself, as accounting more satisfactorily for the phenomena observed, is that the injurious effects produced by microbes are due, not only to what they take or what they excrete, but what they leave in different cases, and this is closely associated with the imperious demand they make for oxygen. The bacilli anthracis being aerobic, they must obtain the oxygen they require for the process of life from the tissues by which they are surrounded; and when oxygen is withdrawn from such complex compounds as those which occur in the animal's tissues, after an apparent fictitious improvement, the elements enter into new combinations, and then, under the name of ptomaines are believed to be the really poisonous agents. An animal's body is capable of resisting the action of such foreign agents probably better than that of active and living germs, and so long as the poisonous chemical agents do not occur in excess, only partial, or modified harm comes from their action. The Principal Veterinary Surgeon in India, in his D.O. dated, Umballa, 31st December, 1886, observes,—“Formerly only such cases as died were considered as anthrax, whilst numerous other cases occurred at the same time, which went unrecognised. Veterinary Surgeon Mann was one of the first, if not the first to bring this prominently to notice, and in an outbreak here, in N. B. Royal Horse Artillery, last year, in which the most careful taking of temperature of *all* horses was carried out, only a comparatively small percentage of deaths occurred, and these principally in the beginning. In the late outbreaks at Rawulpinnee and Multan, the nature of the disease was clearly set at rest by demonstration of the bacillus anthracis, under the microscope.”

POST MORTEM APPEARANCES.

Post Mortem Appearances ...

The blood was dark and viscid. In some of the larger vessels it formed into distinct, long clots—a similar condition having been described by Arloing in *Charbon Symptomatique* of the French. Ecchymoses in the sub-serous and sub-mucous tissues, but especially beneath the peri-and endo-cardium were constantly seen. V. S. (1st Class) Clayton also informs me that, in the latter situations, this lesion was never absent in a single case, his observations dating from August, 1886. The walls of the heart were soft and flabby, and the peri-cardial sac contained a large quantity of fluid. The lungs were the seat of congestion, and catarrhal inflammation, being enlarged and increased in weight, owing to consolida-

tion. The Peyer's patches were found congested, and the mucous coat of the stomach showed dark-brown, irregular patches of extravasation. Very often the entire mucous membrane of the small intestine appeared swollen and congested; in many cases, ulcerations were also noticed. The liver was enlarged, soft and friable. The spleen was also frequently enlarged and indurated, though not in all cases. Dropsical swellings were always present, generally under the arms, in front of the sternum, along the course of the trachea, and in the region of the larynx; also between the thighs, under the abdomen, &c.

DIAGNOSIS.

Diagnosis

... From relapsing fever it is easily distinguishable by the following characters, *viz.*,— In relapsing fever several relapses occur during its course, whereas in this disease there is seldom more than a single relapse noted, and if the temperature rises at all after that, it is due to complications. 2. The digestive organs usually exhibit nothing particular in relapsing fever (Quain's Dictionary of Medicine); in remittent anthrax in the horse, digestive lesions, both in the stomach and small intestine, were found to be common in the last outbreak, and are characteristic also of remittent fever in man. In the horses of the 19th Bengal Lancers, for instance, which died from this disease, gastro-intestinal lesions were seldom absent. And Veterinary Surgeons Ringe and Nuthall, A. V. D., mention cases of pronounced ulceration which came under their notice in several cases during the late outbreak. They were commonly seen, either as sub-mucous extravasations or complete ulceration, in the stomach and small intestine of ponies belonging to the 8th Hussars, under my own observation. 3. Pulmonary complications are rare in relapsing fever (Quain's Dictionary), but frequently existed in the outbreak of anthrax in horses, both in Mr. Clayton's cases and in those seen by myself. Under the name of *Malignant Catarrhal Fever*, this form of anthrax was well known to Veterinary Officers in charge of the late Government studs in India more than twelve years ago. V. S. (First Class) Clayton tells me, with reference to the present outbreak, he does not remember a single case in which the lungs were found not affected, on post mortem examination, his observations extending from August, 1886. 4. Ecchymoses under the endo- and peri-cardium were so constantly seen in my own cases, as well as in those seen by the other Veterinary Surgeons, as to be almost diagnostic of anthrax. 5. Paraplegia, stringhalt, muscular tremors, &c., observed in these cases, are more common to anthrax, than to surra. The Principal Veterinary Surgeon in India says, "I have always been of opinion that the disease is anthrax fever. It coincides exactly in its symptoms, course, and post mortem appearances with the disease as it has been known at the various stations in the Punjab." Facts everywhere show the widespread prevalence of anthrax in all countries; and India is behind no other country in the world in the number of outbreaks of this disease seen in our animals. The mortality is high, which is more common to anthrax than relapsing fever (Quain's Dictionary). The cyanosis, or purple colouration of the conjunctiva, submucous extravasations in the stomach and small intestine, the constant ecchymoses under the endo- and peri-cardium, the lung complications, &c., are common to anthrax and not relapsing fever.

The results obtained by the Principal Veterinary Surgeon's inquiries from the reports of Veterinary Surgeons in different stations in India confirm and extend what has been known from clinical experience of the characters of anthrax seen in other countries; and the exact knowledge obtained by the methods of inquiry employed, by carefully comparing the temperature charts, symptoms, and post mortem appearances of different cases at different stations, will lead to an important investigation of the behaviour of this disease, and thus to a more exact method of treatment in the future. The results so far offer a field of research which requires the highest degree of patience and ingenuity on the part of the investigator. The diagnosis may not be easy in a few complicated cases, but due observation of the peculiar combination of symptoms will enable careful practitioners to make a good practical diagnosis.

*ETIOLOGY.***Etiology**

... Some blood sent for my examination previous to my arrival in Meerut, showed very different results in different cases. Thus, the first blood enclosed in hermetically sealed tubes, showed merely putrefactive organisms. In subsequent blood, mounted fresh on slides, I found, on examining under a $\frac{1}{12}$ th objective, several small bacteria, in the form of spherical or slightly oval points, either isolated or in clusters, and which existed in greatest number towards the circumference of the cover glass. I scraped some of this blood on the point of a penknife, and, after diluting it in water, injected a very small quantity under the skin of a rabbit, which died in the course of a couple of days, presenting innumerable longer or shorter rods in its blood examined under the microscope, similar to the bacillus anthracis seen in other animals when suffering from anthrax. Similar injections subsequently made on these animals also produced death, the blood containing numerous rods and chains. Consequently, when I arrived in Meerut, I informed the Inspecting Veterinary Surgeon the result of my examinations of the blood I had received from Meerut, before proceeding to study the clinical aspects of the disease in the horse. Next day a horse affected with the disease was shown to me by Veterinary Surgeon (First Class) C. Clayton, and on examining some blood taken from the angular vein, and placed under the microscope while it was yet fresh, I found the same organisms present which I had seen on slides previously prepared for me, and which were afterwards examined also by Veterinary Surgeon (First Class) C. Clayton, A. V. D. I am glad that I had an opportunity of showing these organisms to Inspecting Veterinary Surgeon Hallen, when in Meerut the other day. V. S. (First Class) Glover also saw one or two slides containing blood from a stallion which had succumbed to the disease some days previously, and in which several short rods were present, both single and in clusters. These rods stained readily in methylene violet and Bismark brown solutions (obtained through Treacher, and Co., of Bombay). Since then, numerous slides have been examined containing fresh blood from affected animals, and have always yielded the same organisms, but more during certain stages of the disease than during others. When the fever is not high, they are sometimes difficult of detection, or may be even altogether absent. In the first cases from which blood was sent to me in hermetically sealed tubes and on slides, for my inspection, I was unable to trace the presence of any parasites; and this may be owing probably to the fact already explained by Dr. Fleming in the *Veterinary Journal* for September, 1878, namely, that blood collected in tubes deprived of air and hermetically sealed, has been shown to lose all activity in about ten days. Pasteur's view of the germs of anthrax being brought up to the surface by earth-worms has also been disproved on this hypothesis, as the bacilli anthracis practically perish in about ten days outside the animal body and when deprived of oxygen (Toussaint) as they would be in hermetically sealed tubes and under compressed cover-glasses. The slides sent for my inspection, moreover, had the cover-glasses carefully glued on at their circumference, which completely deprived the organisms of air. Lastly, Veterinary Surgeon Chicoli (*Il Medico Veterinario*, March, 1876,) states that during the year 1875, there appeared in the district of Corleone, Sicily, an enzooty of anthrax among mares, in which all the lesions of anthrax were found to be present on post mortem, but no bacilli could be discovered in the blood. And yet it was impossible to deny that the disease was anthrax; for, the same disease which broke out among the bovines—driven into the pastures vacated by the mares—was characterised by an abundant development of the bacilli in the blood.

*PATHOLOGY.***Pathology**

... Dr. Wallace Taylor, who studied this disease in Burmah ponies in 1880-1, known under the name of 'kakke,' describes the presence of a small, rod-shaped bacillus in the blood of every case examined, which he found to measure a little longer than a tubercle bacillus, and slightly also thicker than it. He suggests that it is probably identical with the bacillus found in "beri-beri" of the human subject. But, as Dr. Taylor did not try any inoculation experiments on animals, or use even staining re-agents, he was not in a position to come to any classification of an organism he was certainly the first to describe in this country. It will be understood, without our saying so, and merely from the size of the organism described, that it is the bacillus anthracis which Dr. Taylor actually noted. The determination of a particular species of organism, merely from its outward appearances, however, is not always an

easy task, and only comes through a complex, and sometimes tedious method of investigation. Experience has now suggested two great roads to inquiry, which lie in a direction that investigators a few years back did not look in : they are staining tests and inoculation experiments. We know that many known micro-organisms may now be stained by special staining re-agents, and in regard to these bacilli staining readily in methylene violet and Bismark brown solutions, in addition to their size and morphological peculiarities, conclusively establish their identity with the bacillus anthracis met with elsewhere. While the history of the short rods producing longer rods and chains on inoculation of rabbits, still further establishes this identity, when taken in connection. It is well known that the microbes of anthrax multiply by spores as well as by fission ; and there appears very little doubt but that the smaller rods seen by me in this disease, side by side with the longer ones, bear the same relation to one another as a part does to a whole—the first being, in fact, simple off-shoots from the parent rods. One can readily understand, too, the large numbers of the smaller rods in comparison with the longer ones, as the same difference in numbers between parent and offspring would be found among other species also, from the lowest forms of life to man himself ! And the germs of this disease prove no exception to the rule ; on the contrary, they serve as a striking illustration of the supremacy of younger over parent life. So much so is this the case, that a leading characteristic of this disease was found to be the comparative absence of longer rods and chains in the blood of our patients, other than the rabbit, in which latter chains and rods usually abound. So scarce are the longer rods that Toussaint considered the smaller ones, as seen in this disease, to be peculiar of an outbreak of anthrax he saw in France a few years ago, and suggested they should be regarded as a distinct species, differing from the bacillus anthracis in its physical characters, but possessing similar properties of engendering virulent anthrax on inoculation of a healthy animal.

It will be seen that the anthrax microbe, in the course of its evolution, passes through different forms—the spore form, that of longer or shorter rods, chains, &c. ; is, in fact, polymorphous. At first it might have been supposed that the shorter rods were accidentally present in the tissues examined, but rabbits inoculated with blood containing these rods show both shorter and longer rods, as well as chains in the same patient, and which moreover stain alike. There cannot be any doubt, therefore, but that the shorter rods seen by Toussaint and myself, are the rods of anthrax, which not only produce virulent anthrax on inoculation of healthy animals and stain readily in the same colouring fluids as the longer rods and chains do, but, as I have found, *produce the longer rods and chains on transference to the system of another animal,—e. g. rabbits.* It is evident, therefore, that the morphology of the anthrax microbe is not sufficient to determine the species.

Altogether there is a pretty general agreement regarding the contagious (this does not necessarily mean contagion through simple contact of animals) nature of the disease, that it is caused by some specific agent, although that agent was not yet demonstrated, in the case of the present outbreak, previous to my arrival. Every one is agreed also as to a living organism being the cause of so specific a form of fever ; and because weakly animals succumb first, and stronger ones recover, we do not conclude that this is simply a disease of starvation or squalor in grasscutters' ponies, or even—in the case of pulmonary complications so frequently present in this disease—due to exposure. In Paris, cold has been lately applied to dogs in iced chambers, the hair being shaved off on one side till they were collapsed almost, and yet in *no single* case did disease of the lungs ensue. It is probable that neither exposure, nor poor feeding, nor filthy surroundings, are more than the aiding causes of a serious outbreak of this disease, and it is an already proved fact that the bacillus anthracis in the air, water, or food is the *fons et origo male*. With regard to the pathological condition of many of our so-called "new diseases," we are still in the dark, though it is probable they are of the same nature as many old, and sometimes familiar diseases, and differ only in minor physical characteristics of intensity, mode of appearance and other features.

A symptom to which special attention should be directed is motor disturbances. The motor affection was shown by the frequent paraplegia, twitchings and spasms of the muscles, and affected the muscles of the hind legs in particular, producing stringhalt, unsteady gait, &c. Symptoms allied to the above are not uncommonly noted in many outbreaks

of anthrax among horses in Australia (See *Veterinary Journal*, Sept., 1878, p. 211.) These symptoms point to capillary plugging, and effusion on, and affection of the circumvascular connective tissues of the motor apparatus of the brain and the spinal cord as their essential pathology. There can be no doubt about these changes being due to the multiplication of the bacilli anthracis in the capillary blood vessels and their escape outside the vessel walls. This explanation appears all the more feasible when we consider the rate of multiplication peculiar to the anthrax microbe. These cases of partial paraplegia, without paralysis, form at the same time the transition to the 'masked' state of complete loss of power behind noted in many former outbreaks of anthrax in the horse. The belief that all the motor loss is due to plugging of the capillaries is not difficult to explain, the bacilli anthracis increase with marvelous rapidity outside the vessel walls, as in chicken-broth and other cultivation media. The rapidity with which animals lose flesh in these cases, is also characteristic of anthrax. In this disease, where a metamorphosis of the whole of the body has begun, the cells are no longer capable of performing their function, and so we find that the animal wastes away, even when he consumes a fairly large quantity of grass, and is on extra ration during the time of his illness.

Regarding the course of the disease: A very important research, bearing on the conditions of infection of specific diseases, has been recently made in England. In this research it has been pointed out that the initial dose of virus is of great importance, and in several instances exercises a marked influence *on the course and virulence of the disease*. Various laws have now been made out—for example, the pathogenic dose of a virus varies inversely with the predisposition of the animals to the disease in question; in animals not very susceptible to a disease, the severity of the affection varies directly within certain limits with the amount of the virus introduced, &c. It is found that in some cases a small dose of a virus produces only a local effect, while a larger dose kills the animal, and the small dose often protects the animal from the fatal effect of a subsequent large dose. Although it is as yet impossible to measure predisposition, and thus to decide the dose for any animal, still the knowledge of the relation between these two factors is of great importance in throwing light on the manner of spread in many outbreaks; while the fact that a considerable quantity of the virus is in many cases necessary for the production of a disease, explains many anomalies, and affords indications for preventive measures.

We have a better reason than has existed before for believing that the subject of equine fevers promises soon to assume something like definite proportions, corresponding in some degree with the fevers seen in man. The careful studies which have been made of late years concerning the fevers peculiar to the lower animals have supplied the groundwork for the rational treatment of certain hitherto ill-understood cases. Only recently Mr. J.H. Steel, A.V.D., has drawn attention to relapsing fever in equines, and Dr. J. Bland Sutton, of London, has taken up the study of typhoid fever in animals—each of whose labours promise good harvest of results in the not distant future. No other subject is so replete with interest as that of fevers seen in the lower animals, and although the subject has been somewhat shrouded in mystery in the past, we now have at least the prospect of improvement. The facts and conclusions under any circumstances take some time to collect, but when a general system of inquiry has been encouraged, important solutions will be forthcoming, proving many of our former ideas about disease to be both obsolete and useless. This has been very much the history of all the specific diseases: our notions with regard to the causes of these having been completely revolutionised within the last few years only.

Treatment

...

TREATMENT.

The three essential points in the treatment of this disease are, it is obvious, change of air, change of water, and change of locality on the first appearance of suspicious cases. Such indications are not fulfilled by the ordinary plan in vogue of drugging animals. It was change of locality which practically checked the disease in the last outbreak among the horses of the 19th Bengal Lancers Regiment, as previous to it no plan of treatment or prevention had the slightest influence for good. When a few cases of this disease occur in any regiment, the risks of an enzootic attack are considerably increased by keeping the animals in an anthrax contaminated locality week after week. Simple segregation of affected animals does not

suffice to keep the disease in abeyance. The animals must quit with the least possible delay, in order to avoid infection from the tainted ground. Extension of the disease is kept up for months by persistent occupation of tainted lines, until considerable loss has been experienced. In order to obtain a favourable result from our endeavours at prevention, it is necessary to sacrifice the cost of a new flooring, and have recourse to prompt and effectual removal of tainted earth. We must acknowledge that, whilst firmly convinced that dozens of animals may be easily saved by timely adoption of the abovementioned precautions, there are great difficulties and disappointments inseparable from the carrying out of proper segregation, which I believe to be the chief causes of these failures. One great cause of failure, I believe, is inequality of the measures adopted in different outbreaks, when the proper time for prevention had been allowed to pass by. The probability of an extension of this disease, depends less on the special nature of preventive treatment recommended than on inefficiency of such measures as are often employed. The running at large of grasscutters' ponies during an outbreak of this disease is a frequent cause of diminished usefulness of preventive measures which are adopted. V. S. (1st Class) Clayton has forcibly brought this to notice in the case of the disease seen in the 8th Hussars; since his report was made, no fresh cases have appeared among the horses up to date. It is often forgotten that the most critical time for securing the movement of suspected animals is when the disease is absent in others. It is necessarily of greater importance to avoid contracting disease, than merely to attempt to suppress it among an already infected lot of animals. The extreme importance of preventing at every point the chances of entrance of the contagion into untainted lines cannot very well be exaggerated. *A knowledge regarding the period of convalescence is of importance in preventing risk of infection by exposure of healthy animals to one which may have just recovered from an attack and be still convalescent.* Anthrax may be communicated by the sick animal when the severity of the illness is past, and while recovery is being perfected, since every secretion and excretion of the body in this disease is a carrier of infection. Too great care cannot, therefore, be taken, so long as cases of this disease appear, in preventing a return of apparently recovered animals, which are at the time even more dangerous than when suffering from an acute attack and unable to move about. Undue alarm should be avoided, but we must insist on the importance of fresh air, fresh water, and change of locality above all; in the treatment of suspected animals. Recent observation shows that a certain local and seasonable condition is essential to the spread of anthrax, these two factors being found in a porous material, the soil, penetrable by air and water, and soaked with organic substances (local predisposition), and in variations in the moisture and temperature (seasonal predisposition). The first essential condition of prophylaxis is immediate evacuation of the tainted ground, and checking contagion by early isolation of the sick, and by observing the necessary precautions which stave off an attack among the healthy animals. Immunity is also obtained by guarding against exposure, want and debility in the case of grasscutters' ponies, this precaution being found necessary, since transmission of the disease, in these, is often dependent upon constitutional weakness, or upon degrees of predisposition and susceptibility. Acting upon our experience of former outbreaks of anthrax, we may formulate the following rules of prevention, namely,—

(a) Not to return any animals as "fever-free" without having first ascertained, either by the use of the thermometer or other means, that such is the case;

(b) To remove the conditions of soil favourable to the growth of the microbe, the infected standings must be renewed. The prophylactic treatment of tainted localities by enforcing rules of sanitation, and by avoiding the pollution or infection of the earth with anthrax material—cadavers, the manure or offal of diseased animals, will always be the chief means of preventing an outbreak of the disease.

PROTECTIVE INOCULATION.—It is a great satisfaction to learn that the Government of India have under consideration the question of bacterioscopic laboratories being opened in many central stations in India; because there can be no question that such laboratories are necessary, where anthrax-'vaccine' can be prepared for distribution to the different mounted branches of the service, as well as in the agricultural districts throughout the country. Looking not only to the interests of the Army, but to the

necessities of British India, the death-rate from anthrax in all classes of animals is a terrible calamity, and every Government should do its utmost to avert it. The entire tendency of modern inquiry is in favour of protective inoculation ; enormous saving to the country may be effected by organising central laboratories in India for the purpose of sending 'vaccine' fluid into the agricultural districts, and it is difficult to see how postponement of such an evident means of saving to the country is possible. In some parts of Russia where anthrax is very frequent, carrying off some thousands of animals of that country annually, preventive 'vaccination' has reduced the mortality from this disease to 2 per cent., as in every other country in Europe. It may therefore be considered as the most urgent necessity which the Government of India have now under consideration.

Literature

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LITERATURE.

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2. Röll, Lehrbuch der Pathologie und Therapie fur Thierarzte, 1885, *art.* Milzbrand.
3. Dr. Wallace Taylor's Report on a form of Paralysis affecting Ponies in British Burmah, otherwise known as '*kakke*,' 1881.
4. Baels, Zeitschrift f. Clinical Med., 1882.
5. Ballet, On a form of Paralysis consecutive to Beri-beri. "Societe Anatomique," July, 1883.
6. Koeniger, Archives f. Clinical Med., 1884.
7. Mendes, Gazette Medical, Oct., 1884.
8. Shirley Deakin, The Pathology of Obscure Oedema in India, 1886.
9. Veterinary Journal, 1878 and 1886.
10. Il Medico Veterinario, March, 1876.

Clinical Returns, Temperature Charts, &c., of Veterinary Surgeons Walker, Ewing, Pease and others, furnished through the courtesy of the Principal Veterinary Surgeon in India ; as well as written suggestions and advice from the P. V. S. in India. And advice received at every stage of my inquiry from Inspecting Veterinary Surgeon Appleton, V. S. (1st Class) C. Clayton and Officers of the Army Veterinary Department in Meerut.

R. W. BURKE,
Veterinary Surgeon,
Army Veterinary Department.





Condition of a Pony, seen a few hours after an attack of Anthrax.

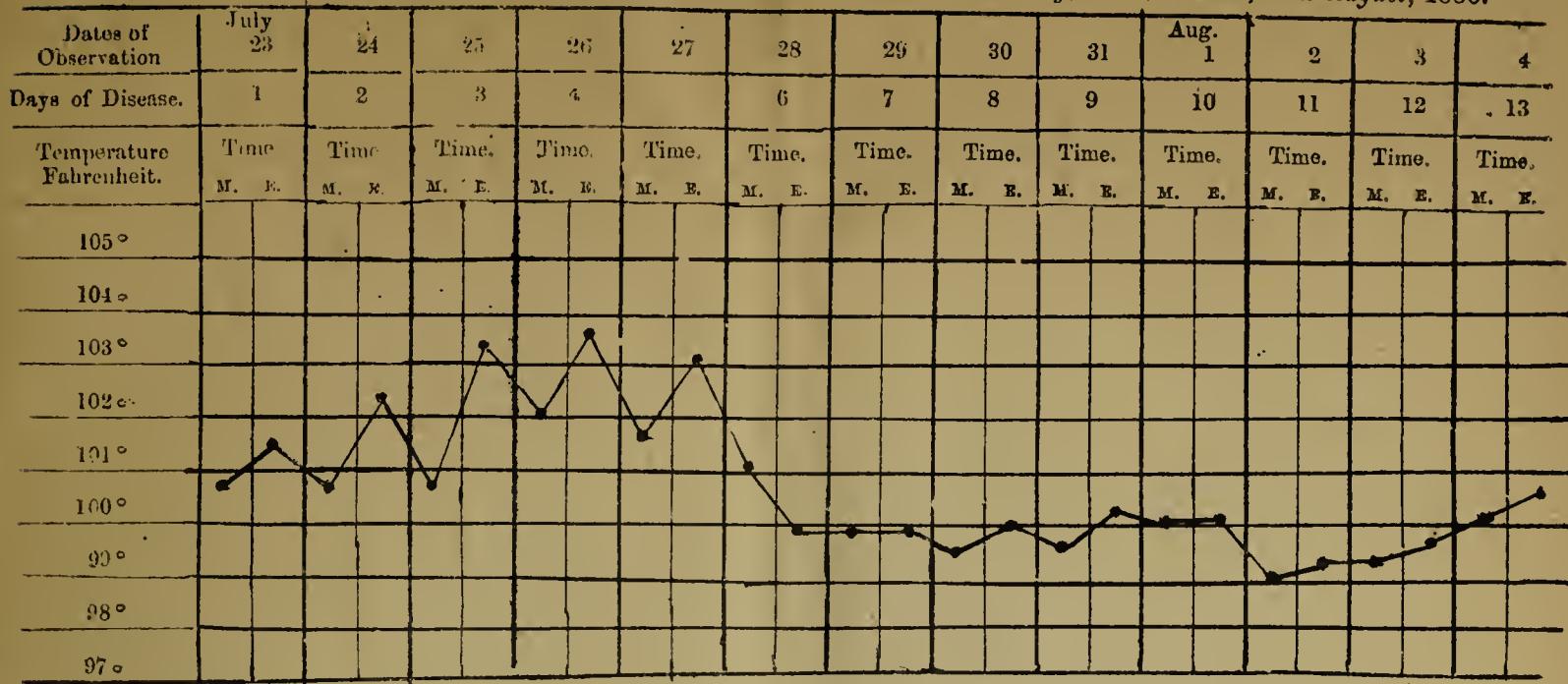


The microbes of anthrax seen in the Meerut outbreak, 1886-7.

R. W. Burke, V.S., A.V.D.

RECORD OF TEMPERATURE.

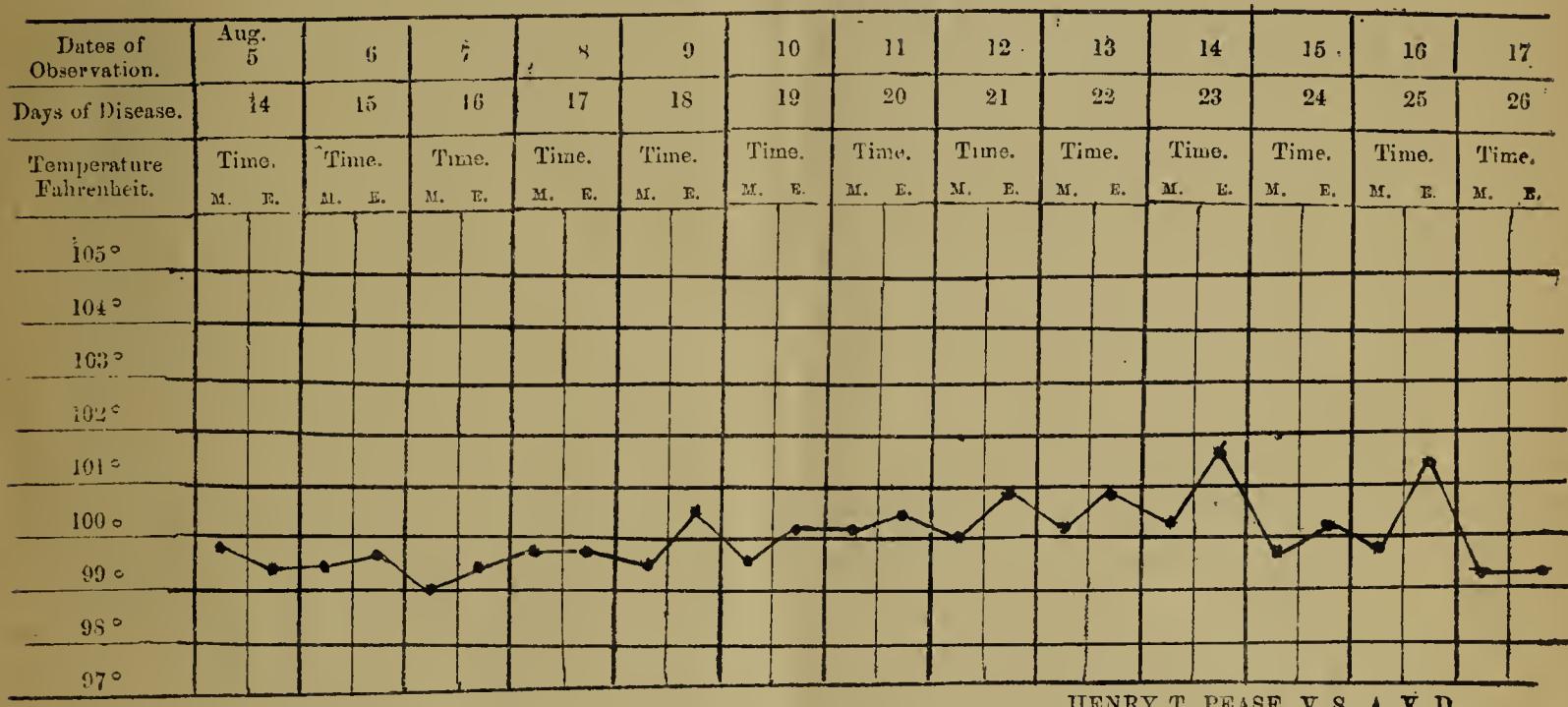
N. B., R.H.A. No. 19, Waler, Gelding, 10 years. Amballa. Anthrax. 23rd July, 1886. Cured, 20th August, 1886.



HENRY T. PEASE, V. S., A. V. D.

Printed at the Hashmi press, Mircut.

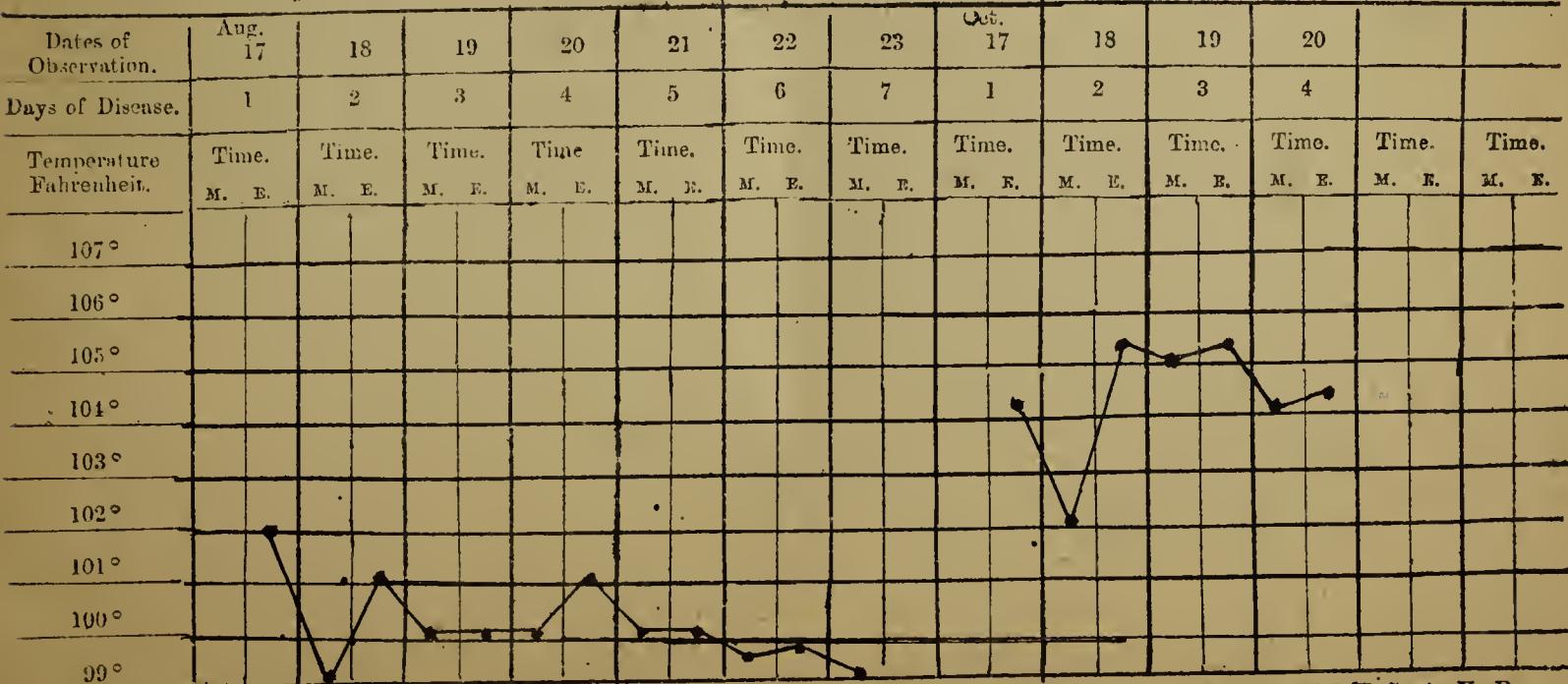
N. B., R.H.A. No. 19—(Continued.)



HENRY T. PEASE, V. S., A. V. D.

J/2 R. A. No. 13, Waler, Mare, 14 years, Rawal Pindi. Anthrax. 17 Aug., 1886. Cured, 2 Nov., 1886.

J. Battery, 2nd Bde., R.A. No. 50, Waler Gelding, 6 years, Rawal Pindi, Anthrax, 17th Oct., 1886. Died, 20th Oct., 1886.



W. WALKER, A. V. D.
(V. S. 1st Class.)

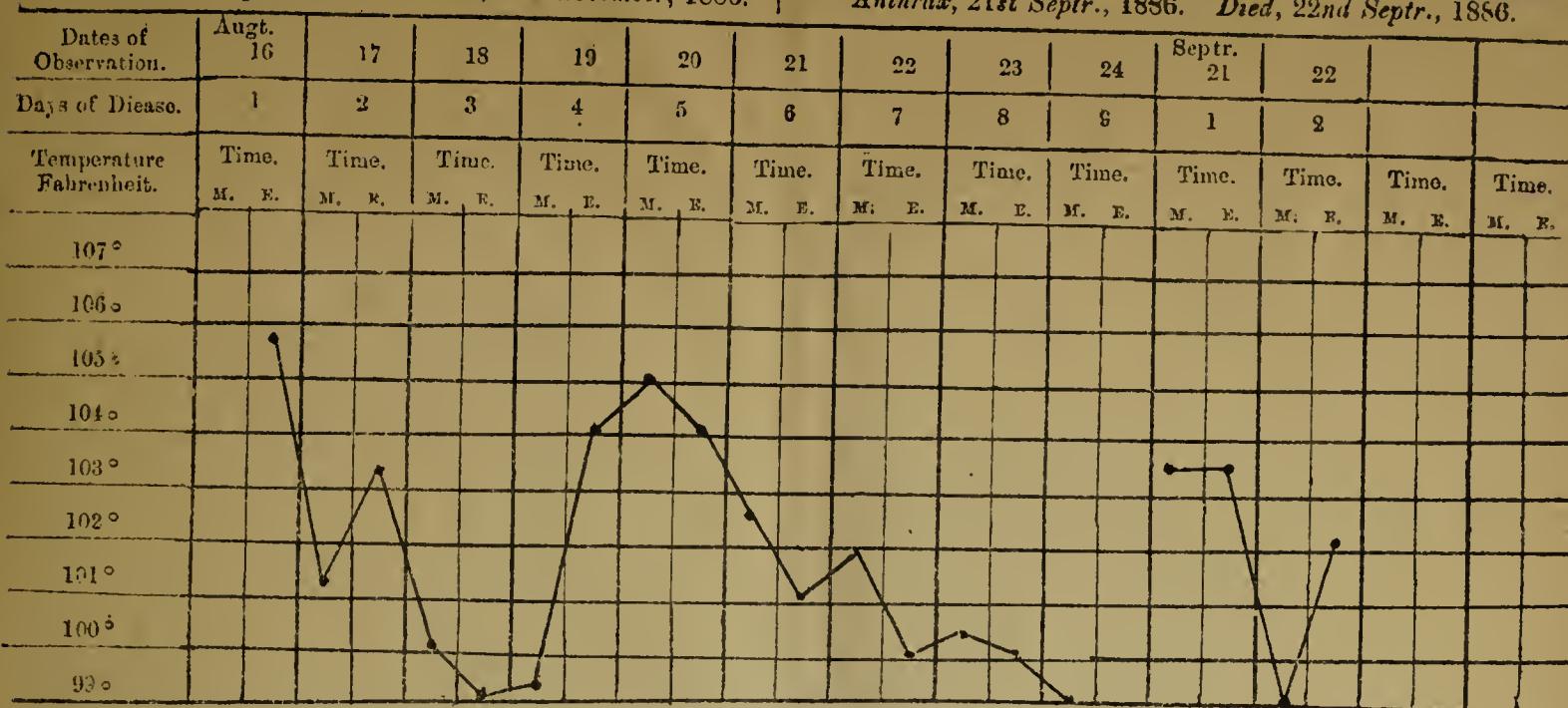
Note the morning remissions, R. W. Burke, V. S., A. V. D.

W. D. GUNN, V. S., A. V. D.

RECORD OF TEMPERATURE.

J/2. R. A. No. 62. Waler, Mare, 5 years. Rawal Pindee. Anthrax. 16th August, 1886. Cured, 2nd November, 1886.

B. Bde. R. H. A. No. 2, Waler Gelding, 7 years. Rawal Pindee. Anthrax, 21st Sept., 1886. Died, 22nd Sept., 1886.



W. WALKER, A. V. D.
(V. S. 1st Class.)

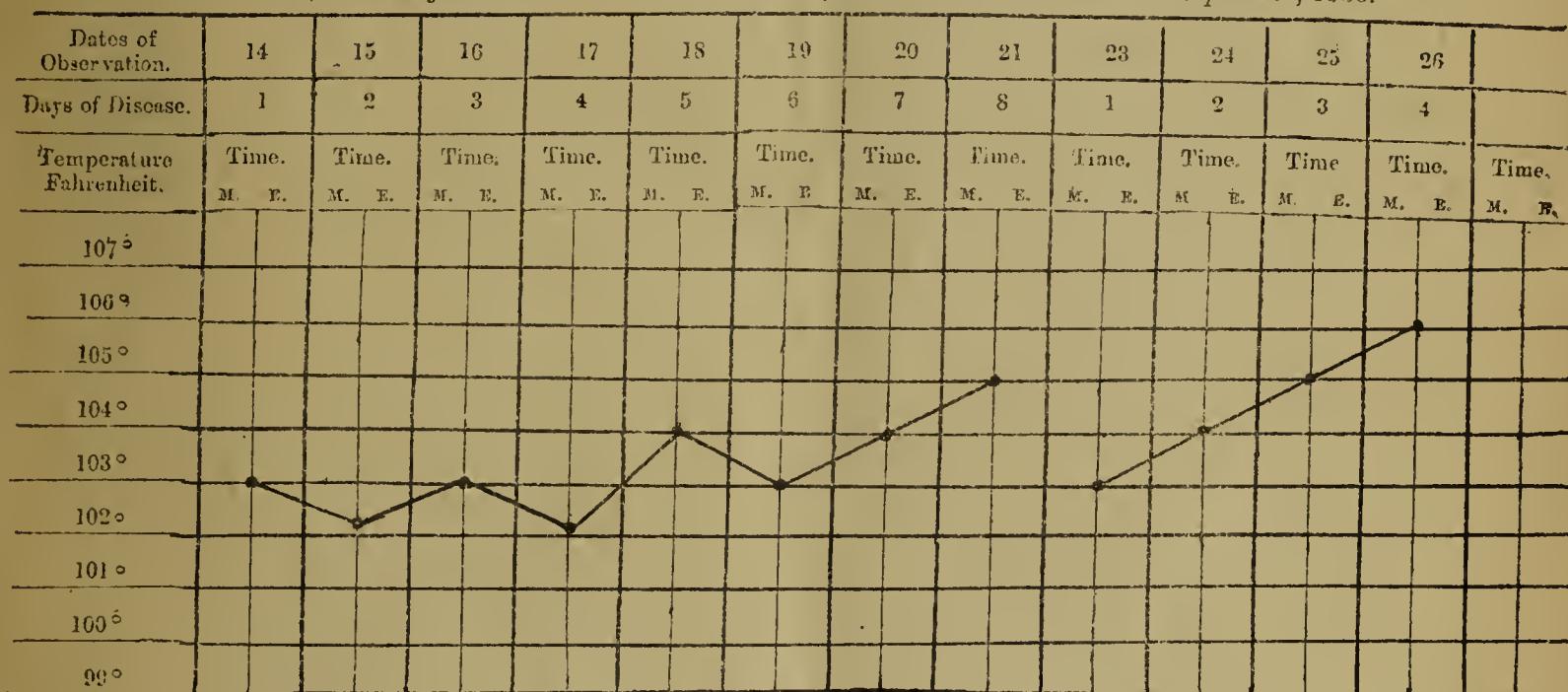
Note the morning remissions.
R. W. Burke, V. S., A. V. D.

W. WALKER, A. V. D.
(V. S. 1st Class.)

19th B.L. No. 435, Troop Mare, 13 years. Meerut, 14th Augt, 1886.

Died, 22nd August, 1886.

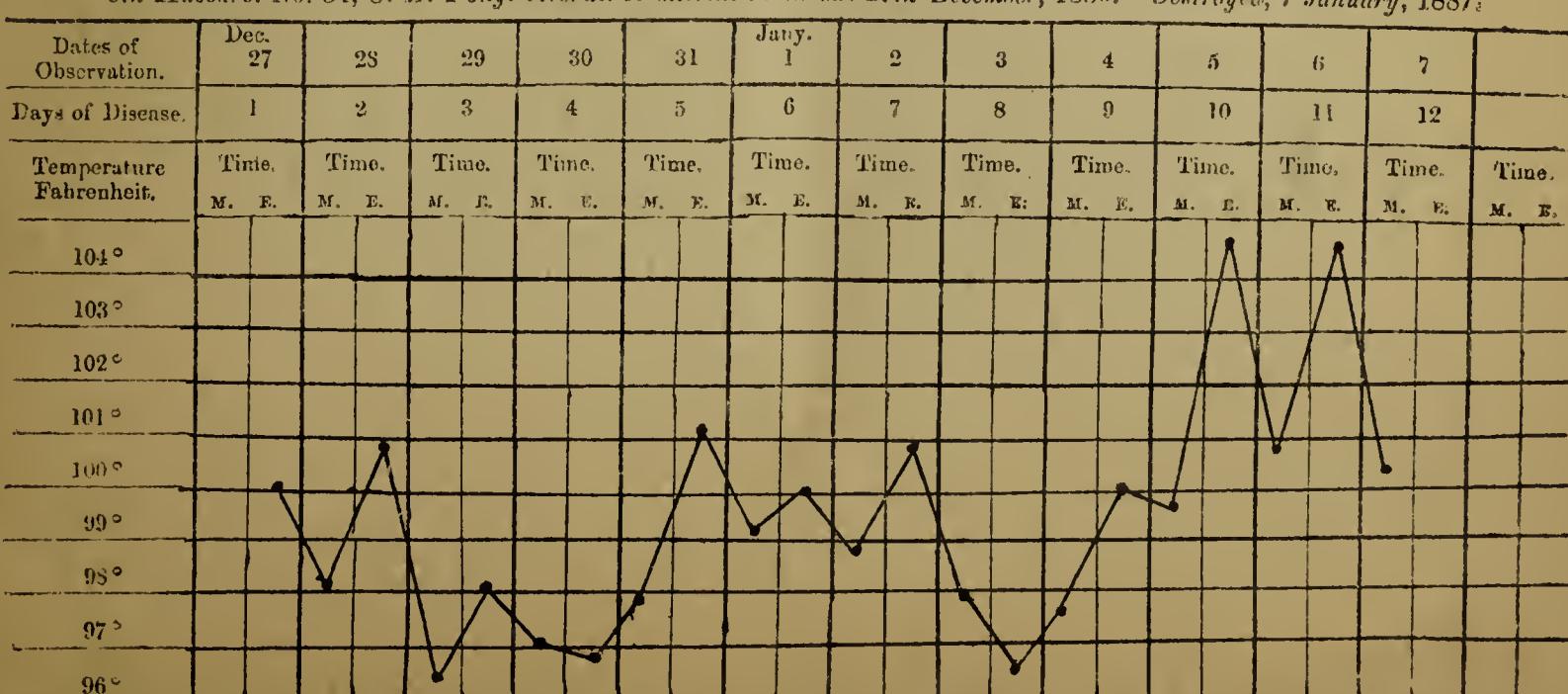
19th B. L. Grasscutter's Pony. Meerut, 23rd September, 1886.
Died 29th September, 1886.



C. E. NUTHALL, V. S., A. V. D.

C. E. NUTHALL, V. S., A. V. D.

8th Hussars. No. 31, C. B. Pony. Meerut. Remittent Anthrax. 27th December, 1886. Destroyed, 7 January, 1887.

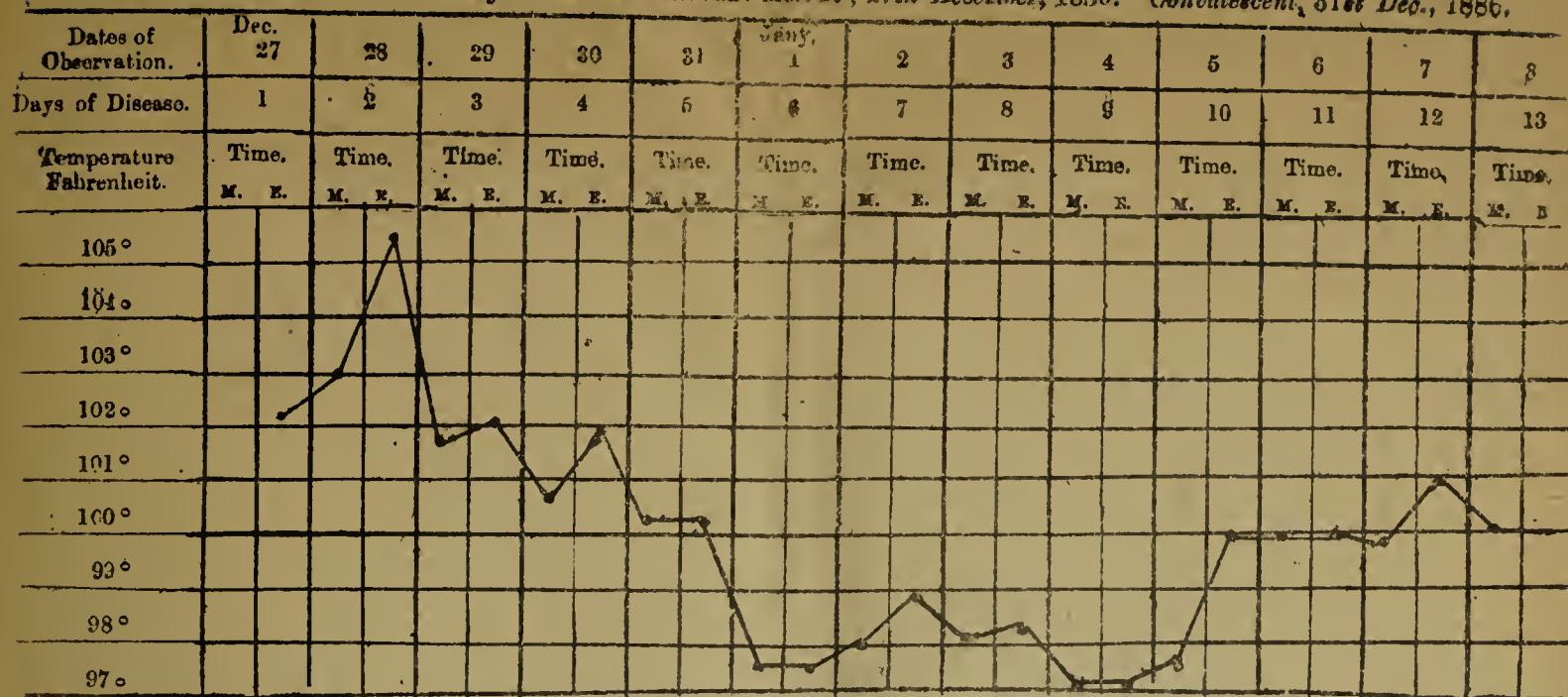


Fetidial spots on the eyes, shivering, laboured breathing, &c. Swelling under jaw and of scrotum. Cyanosis of conjunctiva on 5th day, and diarrhoea on morning of the 6th. Swelling of scrotum pronounced on the 4th January, 1887. Animal being down on the ground on the 6th January, was destroyed by order on the 7th i.e.

R. W. BURKE, V. S., A. V. D.

RECORD OF TEMPERATURE.

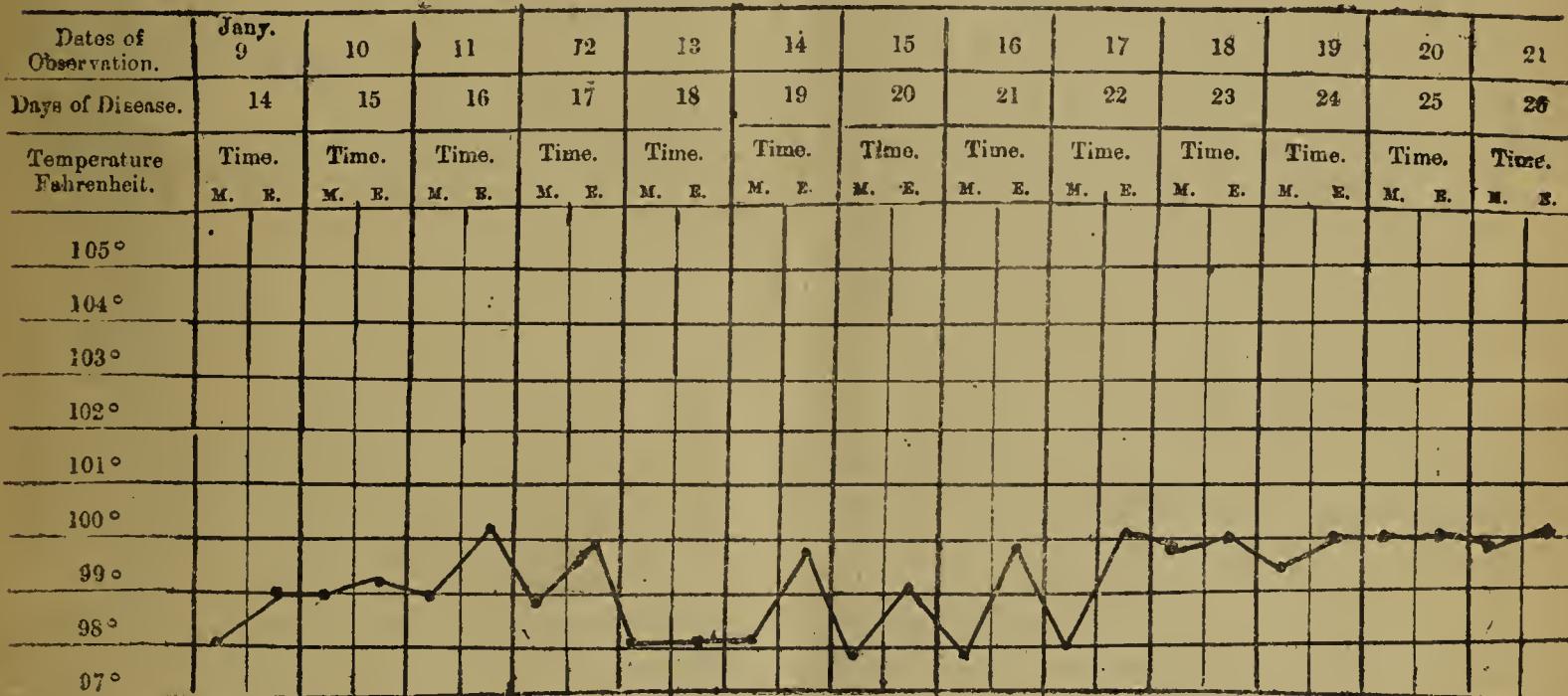
8th Hussars. No. 13, O. B. Pony. Remittent Anthrax. Meerut; 27th December, 1886. Convalescent, 31st Dec., 1886.



Petechial spots on the eyes, severe diarrhoea, hurried breathing, &c. Numerous rod shaped bacilli in the blood examined on 2nd day. Swelling under sternum, and cyanosis of conjunctiva on 3rd day.

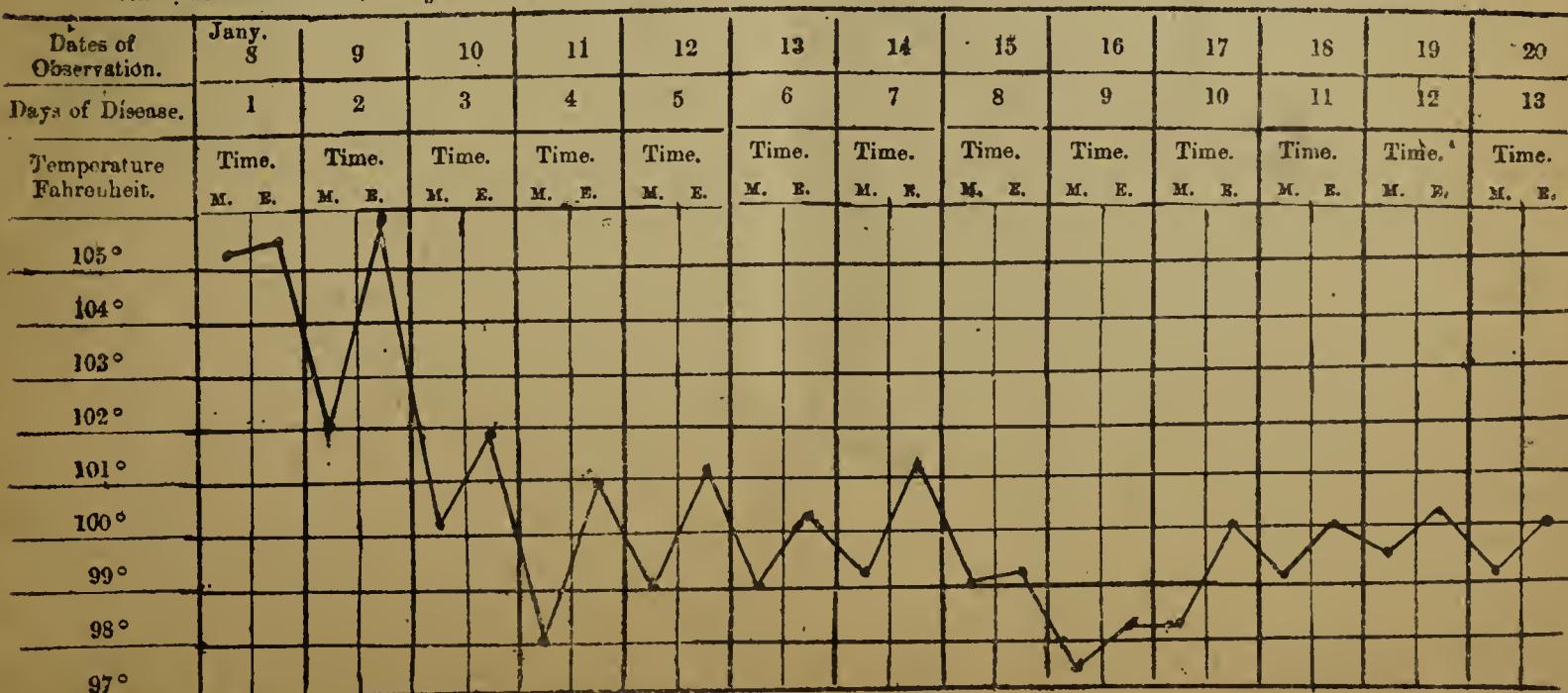
R. W. BURKE, V. S., A. V. D.

8th Hussars. No. 13, C. B. Pony.—(Continued.)



R. W. BURKE, V. S., A. V. D.

8th Hussars. No. 17, Pony. Anthrax, Remittent. Meerut; 8th January, 1887. Convalescent, 12th Jany., 1887.



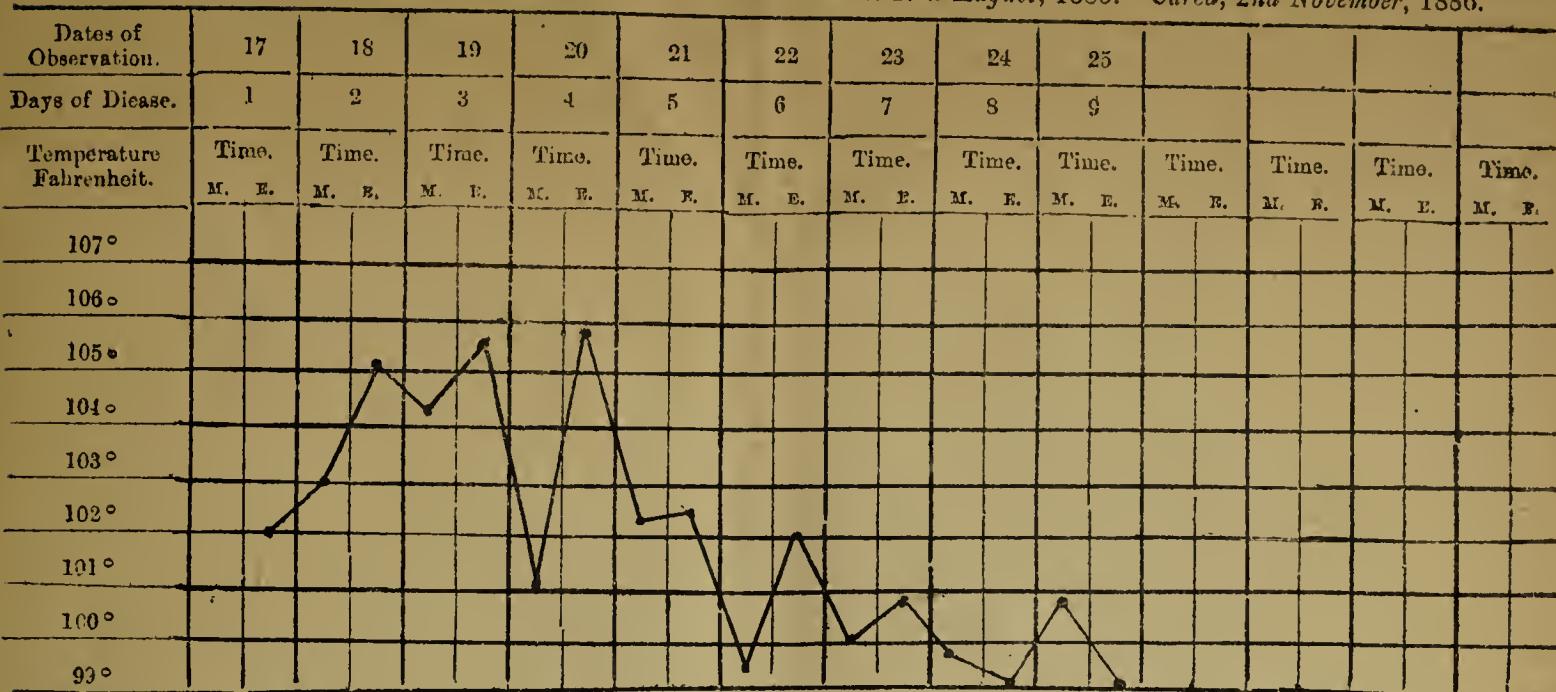
Petechiae, catarrh, emaciation

Note the morning remissions.

R. W. BURKE, V. S., A. V. D.

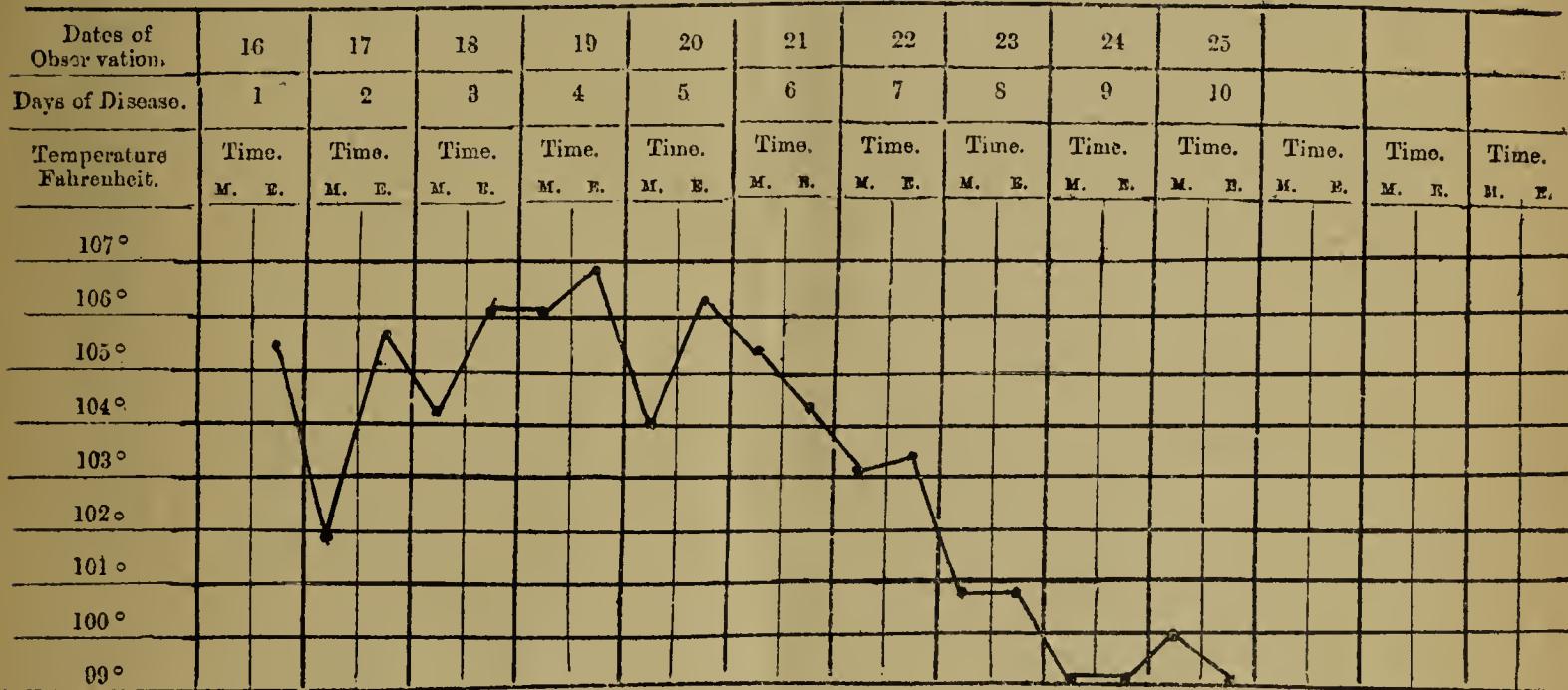
RECORD OF TEMPERATURE.

J/2. R. A. No. 9. Waler, Gelding, 5 years, Rawal Pinday. Anthrax. 17th August, 1886. Cured, 2nd November, 1886.



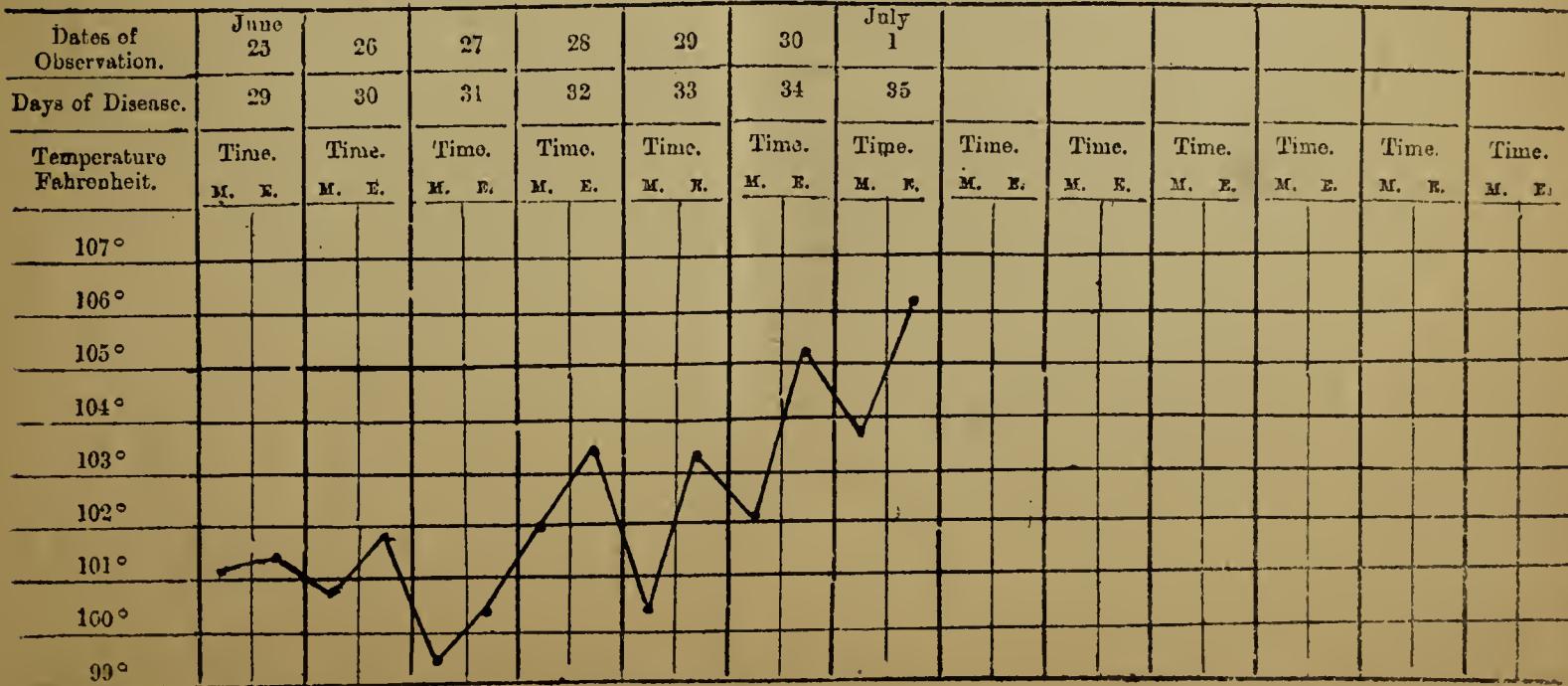
W. WALKER, A. V. D.
(V. S. 1st Class.)

J/2 R. A. No. 18, Waler Gelding, 5 years, Rawal Pinday, Anthrax, 16th August, 1886. Cured, 2nd November, 1886.



W. WALKER, A. V. D.
(V. S. 1st Class.)

N/B, R. H. A., No. 89. Waler Gelding, 7 years. Umballa. Anthrax. 28th May, 1886. Died, 1st July, 1886.



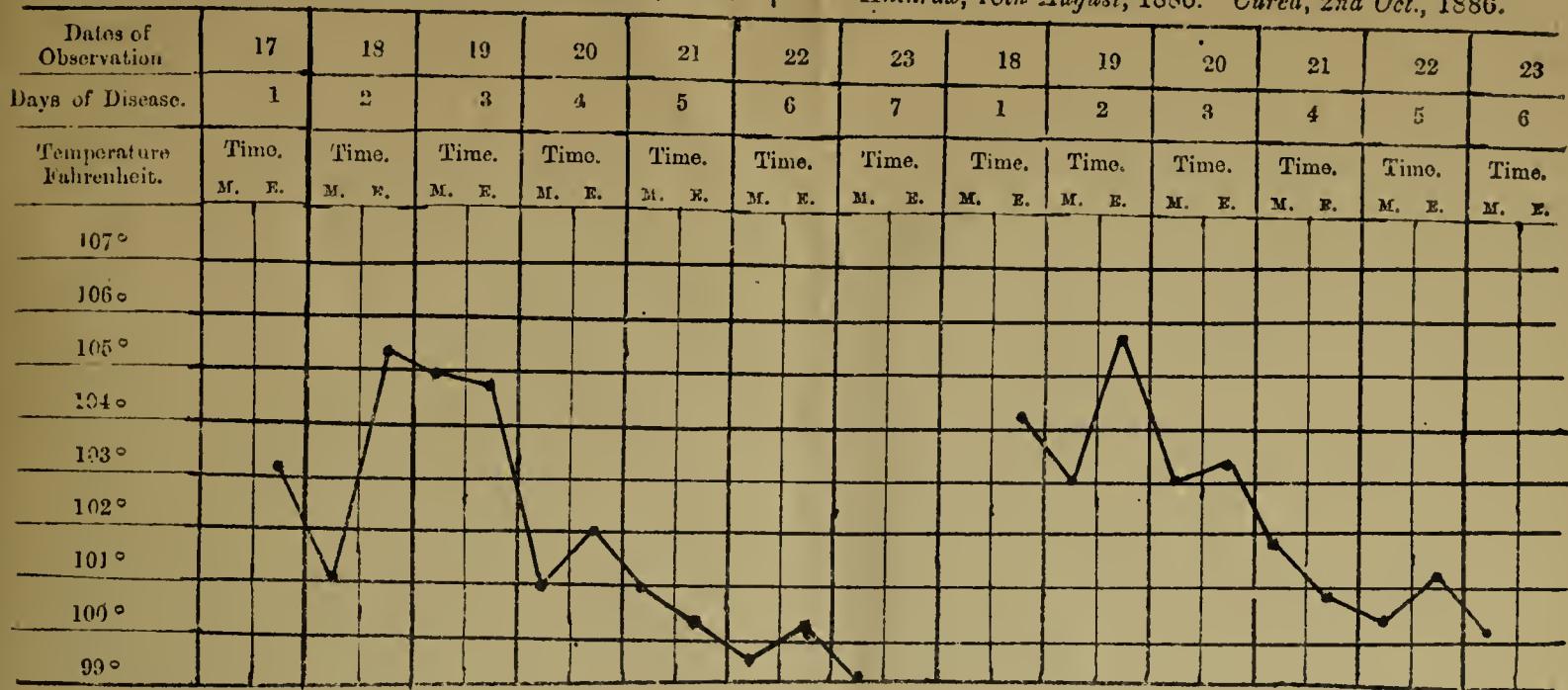
Note the morning remissions in the above charts. R. W. Burke, V. S., A. V. D.

ED. EWING, A. V. D.
(V. S. 1st Class.)

RECORD OF TEMPERATURE.

J/2 R. A. No. 17, Waler Gelding, 9 years, Rawal Pindee,
Anthrax, 17th August, 1886. Cured, 2nd November, 1886.

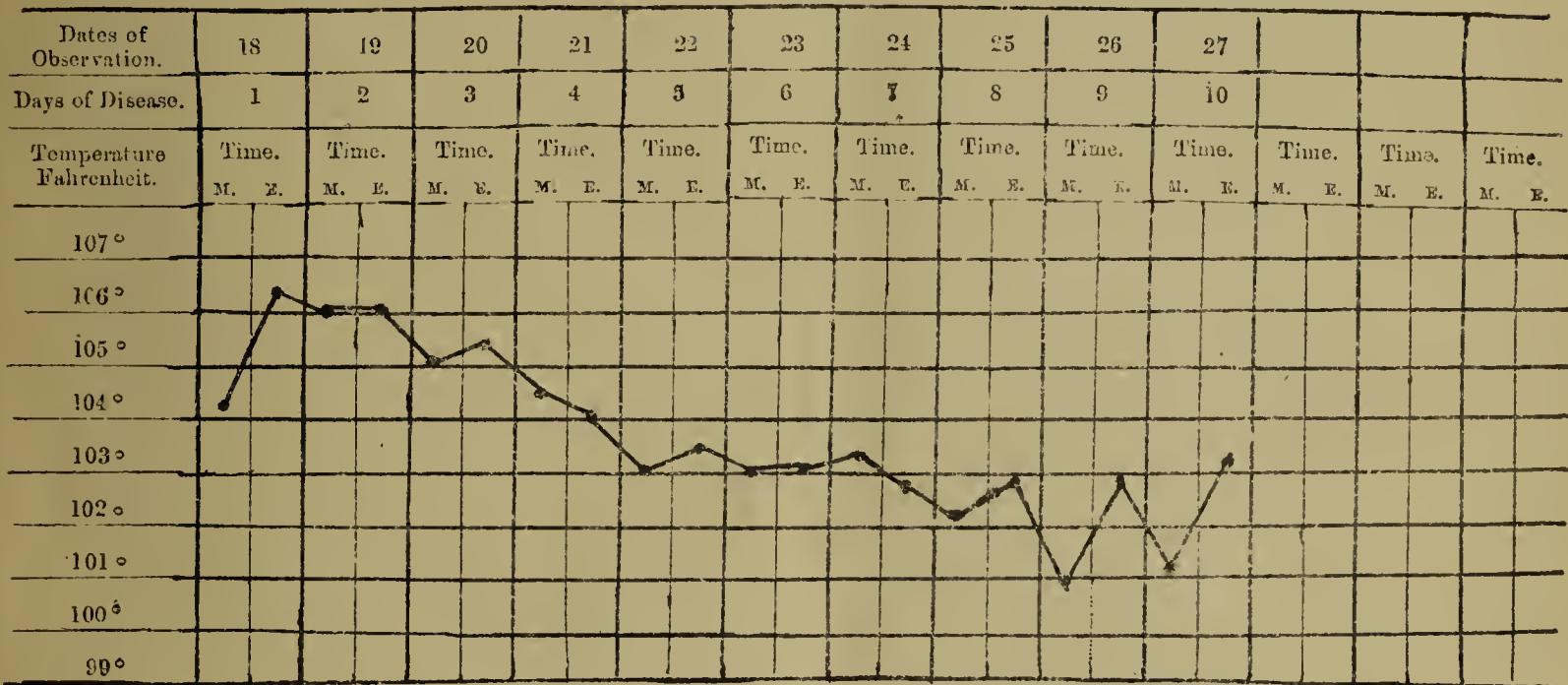
J/2 R. A. No. 44, Waler Mare, 10 years, Rawal Pindee.
Anthrax, 18th August, 1886. Cured, 2nd Oct., 1886.



W. WALKER, A. V. D.
(V. S. 1st Class.)

W. WALKER, A. V. D.
(V. S. 1st Class.)

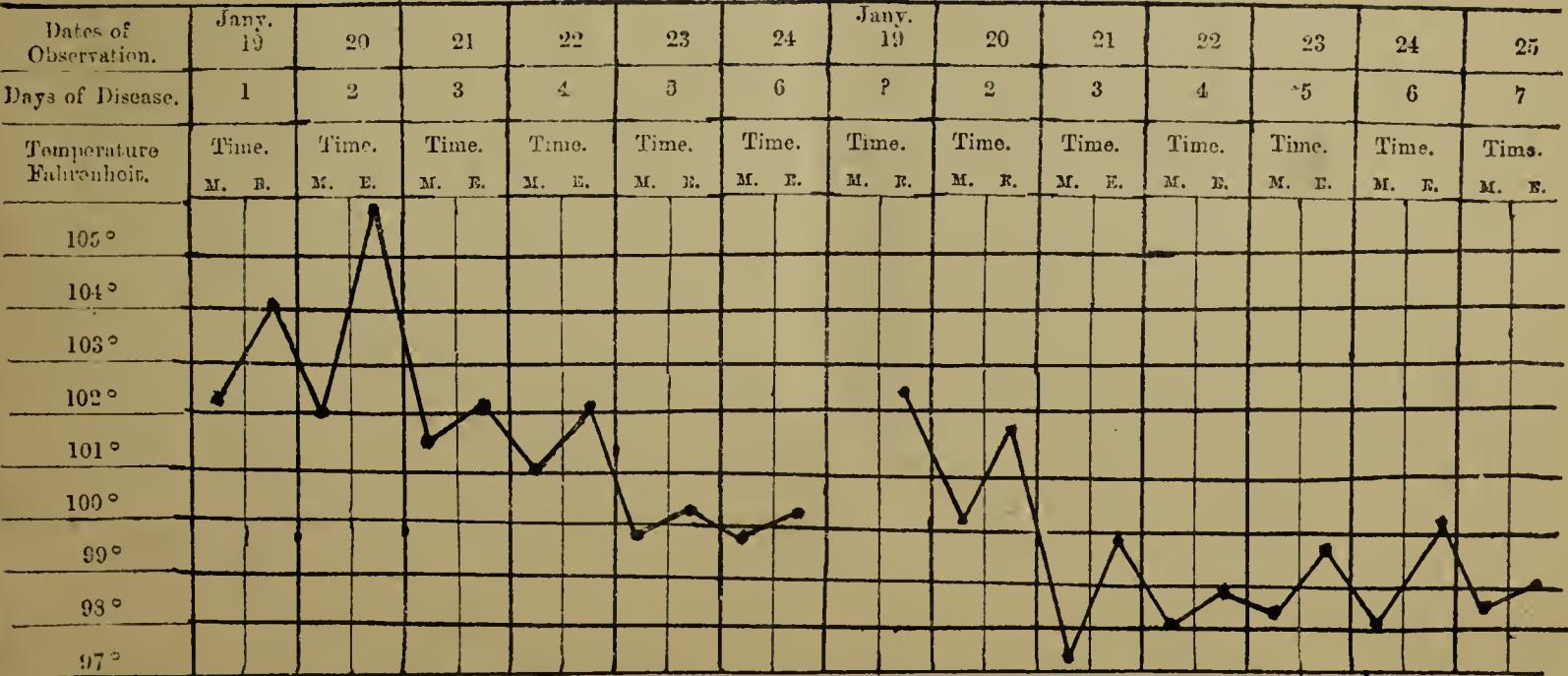
I/2, R. A., No. 89, Waler, Mare, 6 years. Rawal Pindee, Anthrax, 18th August, 1886. Died, 27th August, 1886.



W. WALKER, A. V. D.
(V. S. 1st Class.)

10th Hussars. No. A. 10. Pony. Remittent Anthrax.
Meerut; 19 Jany., 1887. Convalescent, 23 Jany., 1887.

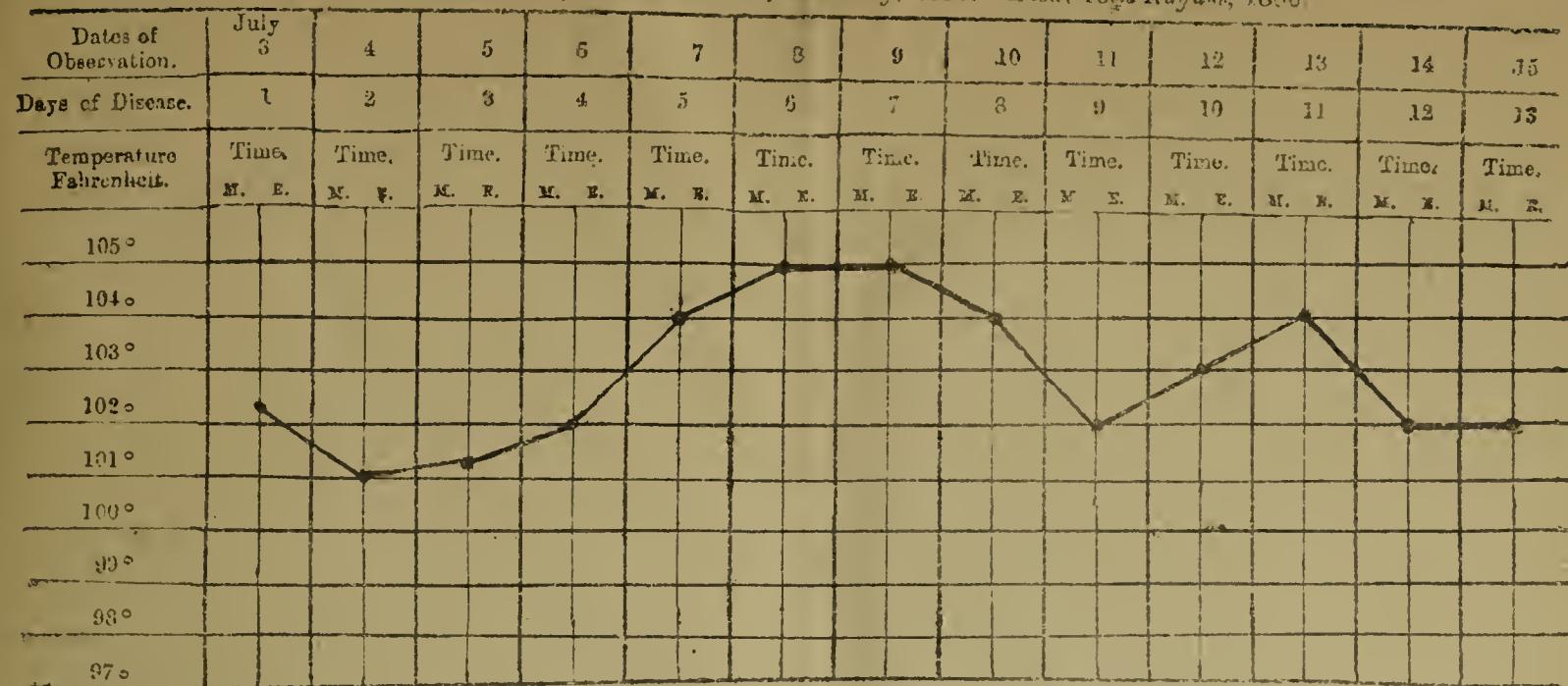
10th Hussars. No. G. 7, Pony. Remittent Anthrax.
Meerut; 19 Jany., 1887. Convalescent, 22 Jany., 1887.



No. A. 10, Platting of the fore legs, paraplegia, petechial spots on the membrana nictitans, &c. Rod-shaped bacteria in the blood examined on the 1st day. No. G. 7, Cough, nasal discharge, petechial spots on the membrana nictitans, &c. Note the remissions in the above charts.

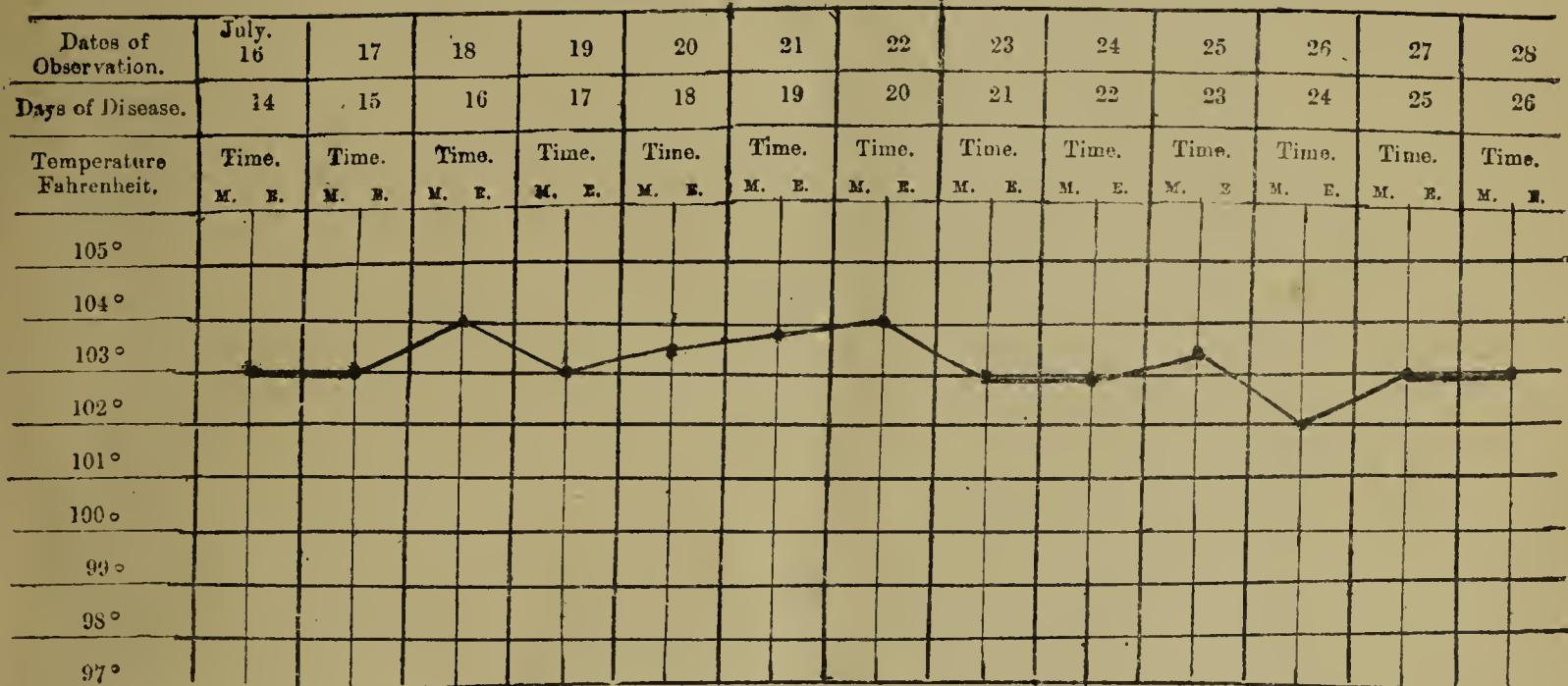
RECORD OF TEMPERATURE.

19th B. L. No. 429, Troop Horse, Meerut; 3rd July, 1886. Died, 16th August, 1886.



C. E. NUTHALL, V. S., A. V. D.

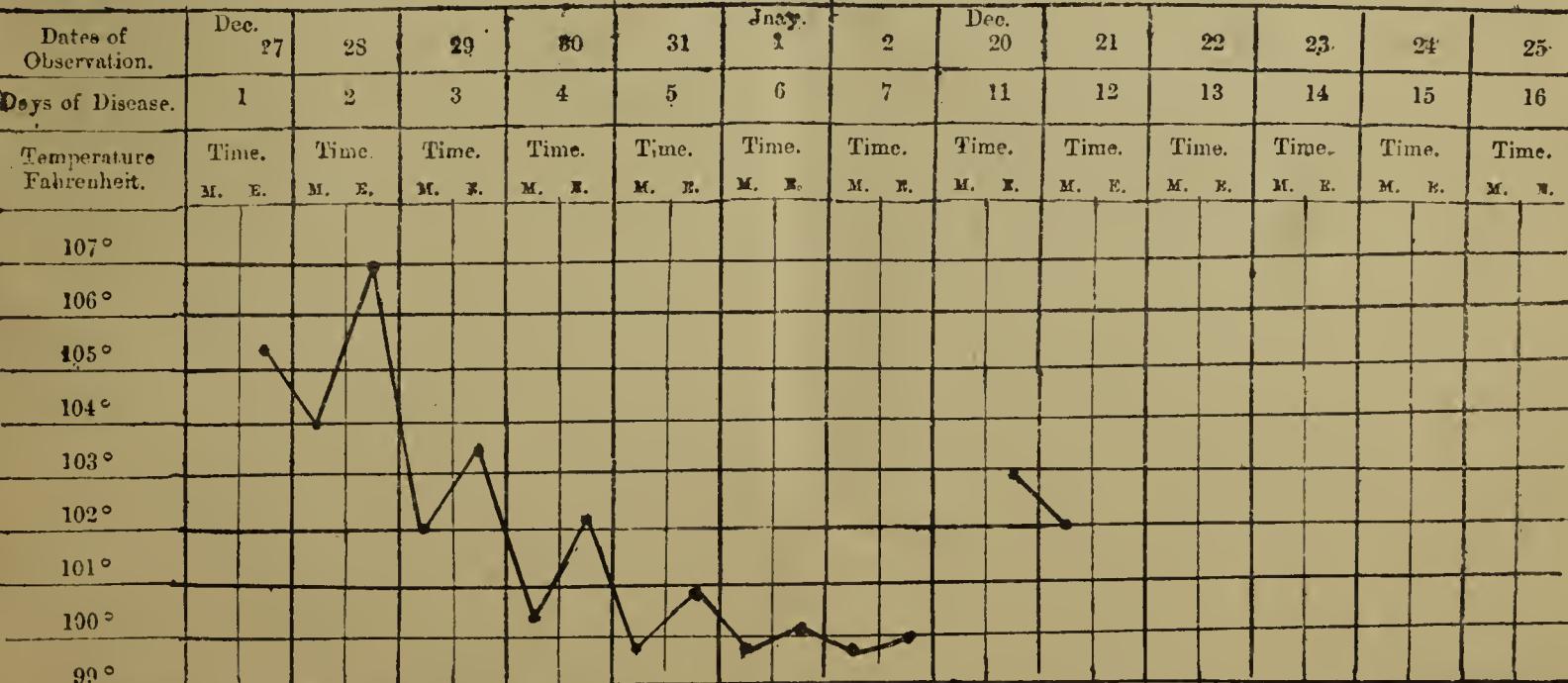
19th B. L. No. 429—(Continued.)



C. E. NUTHALL, V. S., A. V. D.

8th Hussars. No. 23, Pony. Anthrax, Remittent. Meerut; 27 Dec., 1886. Convalescent, 1 Jany., 1887.

8th Hussars. No. D. 14, Pony. Meerut; 10 Dec., 1886. Destroyed, 21 Dec., 1886. Under care of Mr. Clayton.

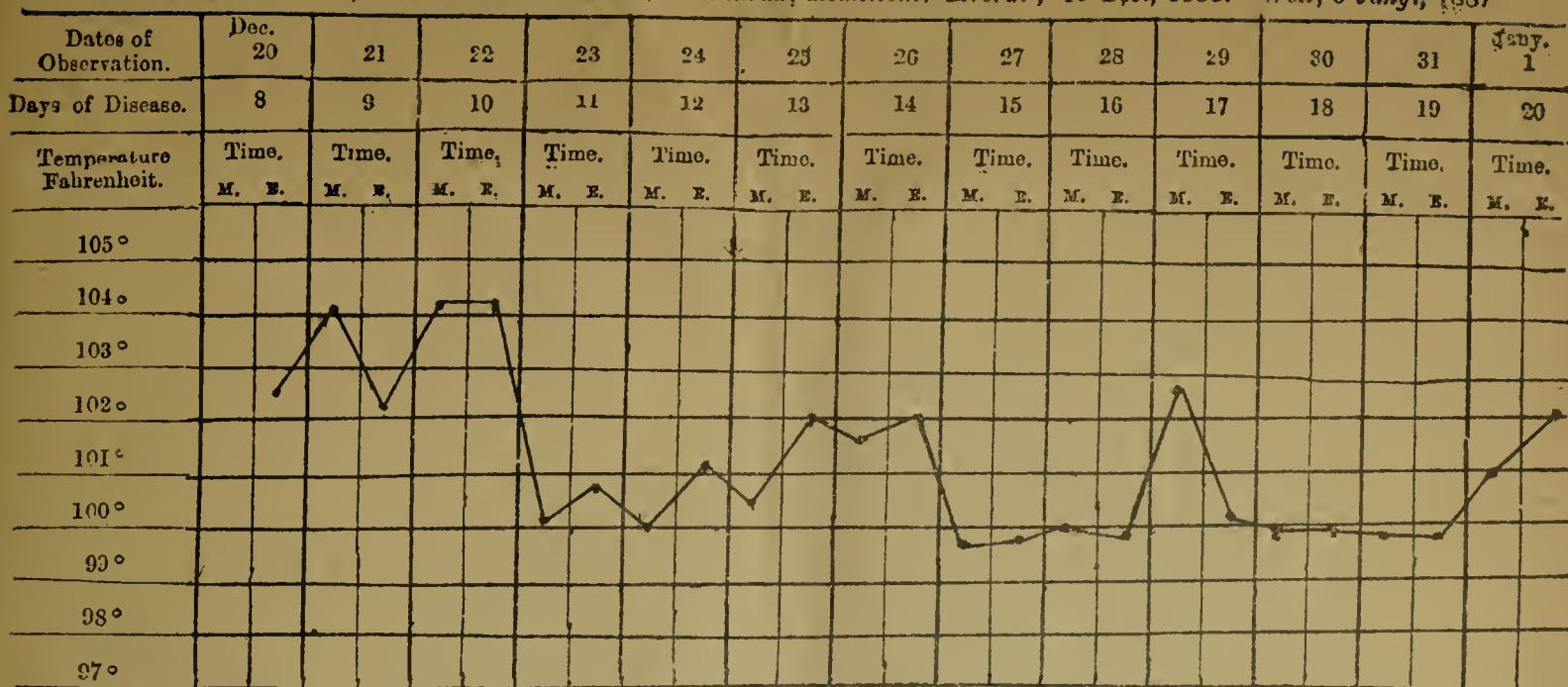


Petechial spots on the membrana nictitans, loss of appetite for the first three days, swelling under abdomen, &c. Platting of the legs and peculiar quit behind, noticed on the first and second days only. Numerous rod-shaped bacteria in the blood examined on the 28th Dec., 1886. Temperature, normal since the 1st January, 1887. D. 14, destroyed the day after my arrival, being down on the ground since the 19 Dec., 1886.

B. W. BURKE, V. S., A. V. D.

RECORD OF TEMPERATURE.

8th Hussars. No. F. 69, Persian Entire. Remount. Anthrax, Remittent. Meerut; 13 Dec., 1886. Well, 9 Jany., 1887

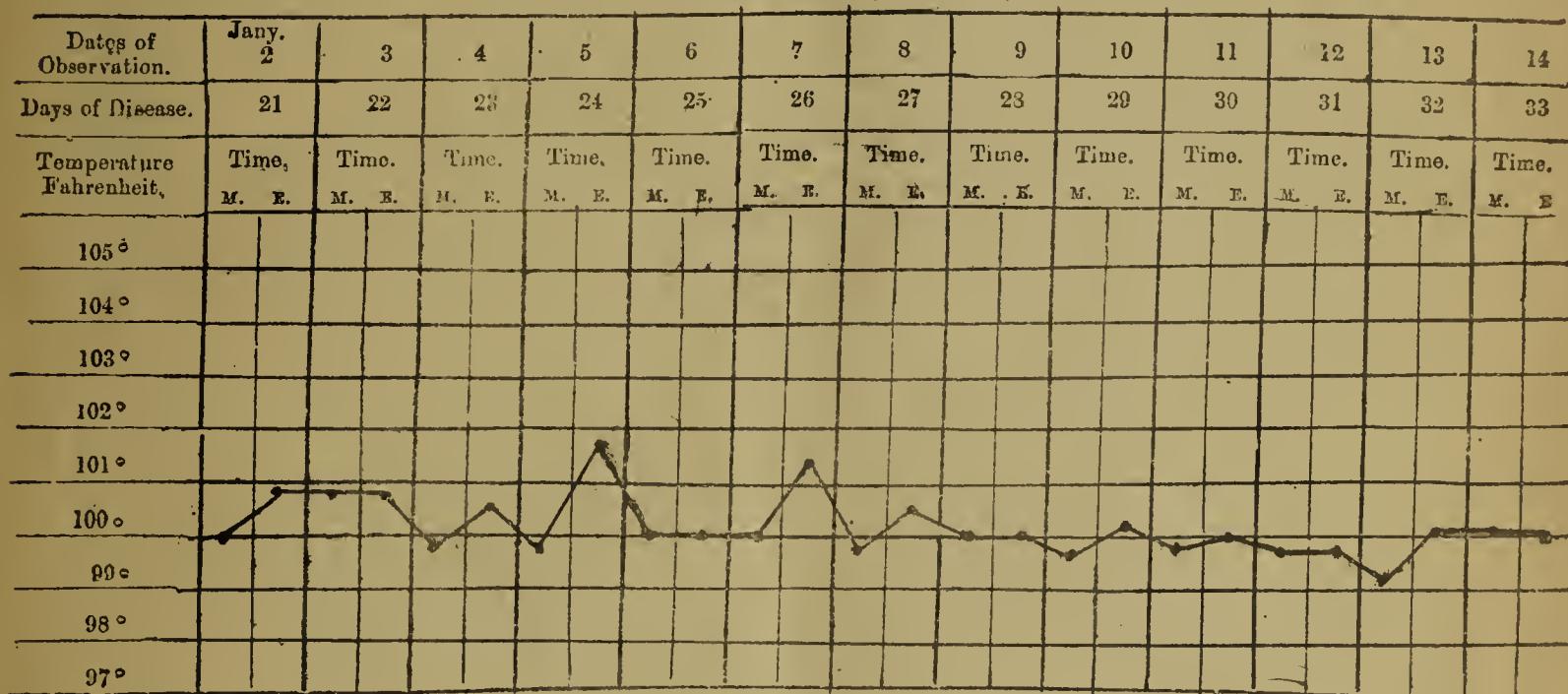


Case under treatment of V. S. (1st Class) Clayton, previous to my arrival on 20th Dec., 1886.

Petechial spots on the eyes, paraplegia, inordinate thirst, slightly hurried breathing, swelling of the scrotum, &c. Breathing, laboured; and nasal discharge on the 17th day of disease. Numerous short rods in blood examined on 22nd Dec., 1886.

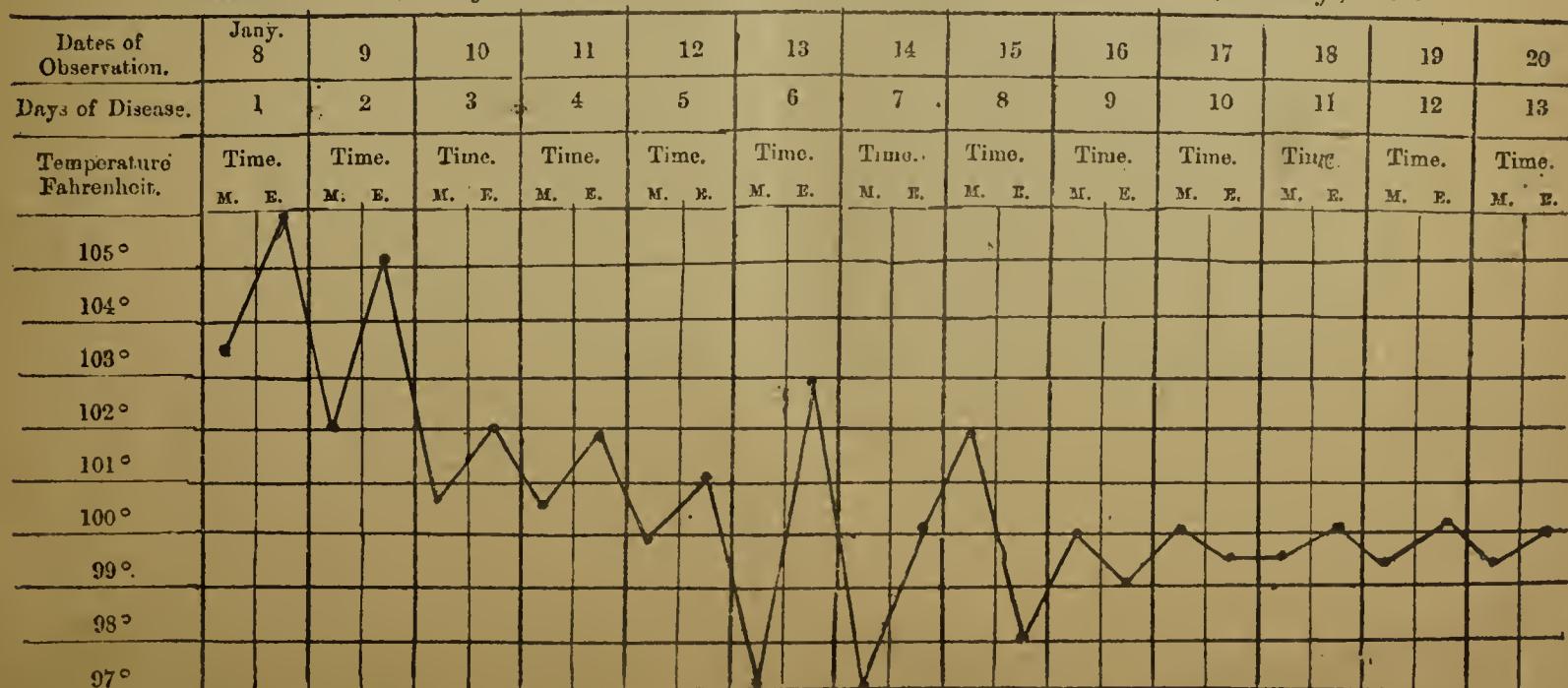
R. W. BURKE, V. S., A. V. D.

8th Hussars. No. F. 69—(Continued.)



R. W. BURKE, V. S., A. V. D.

8th Hussars. No. G. 3, Pony. Remittent Anthrax. Meerut; 8 Jany., 1887. Convalescent, 19 Jany., 1887.



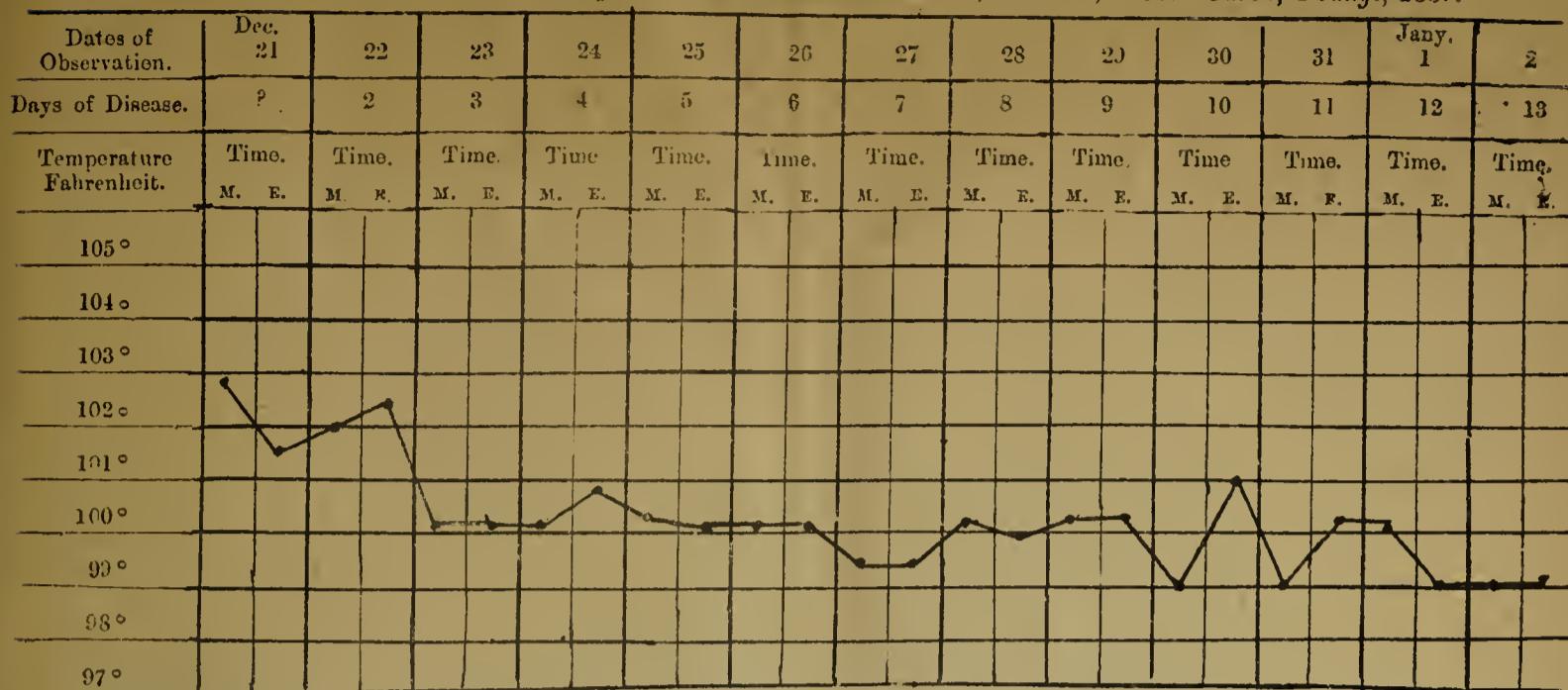
Petechial spots on the membrana nictitans, cough and nasal discharge, and swelling of sheath. Extreme emaciation.

Paraplegic on the 2nd day only.

R. W. BURKE, V. S., A. V. D.

RECORD OF TEMPERATURE.

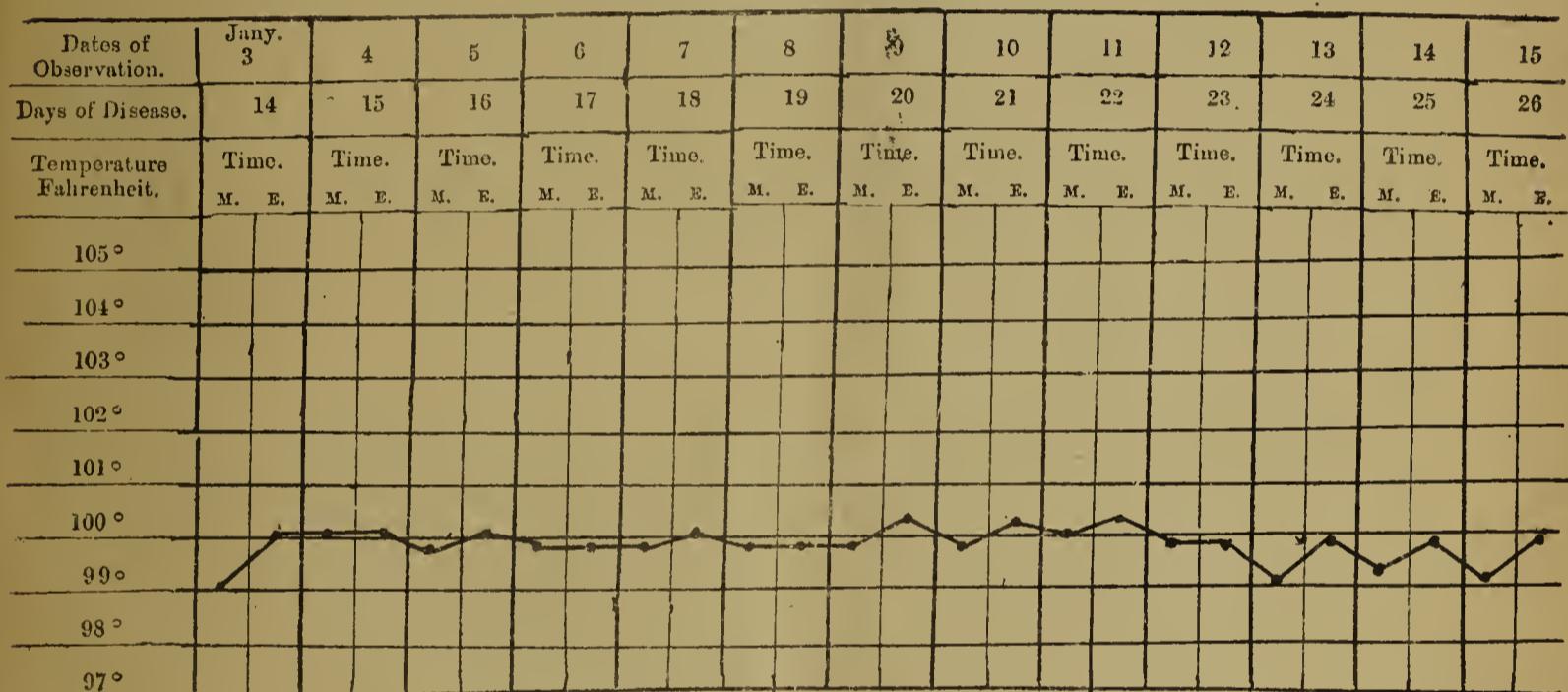
8th Hussars. No. A. 58, Persian Gelding. Anthrax, Remittent. Meerut; 21 Dec., 1886. Cured, 4 Jany., 1887.



Tetechiae, recurrent stringhalt, paraplegic on 10th day. Short, rod-shaped bacilli in blood examined on 1st day. Treated with carbolic acid.

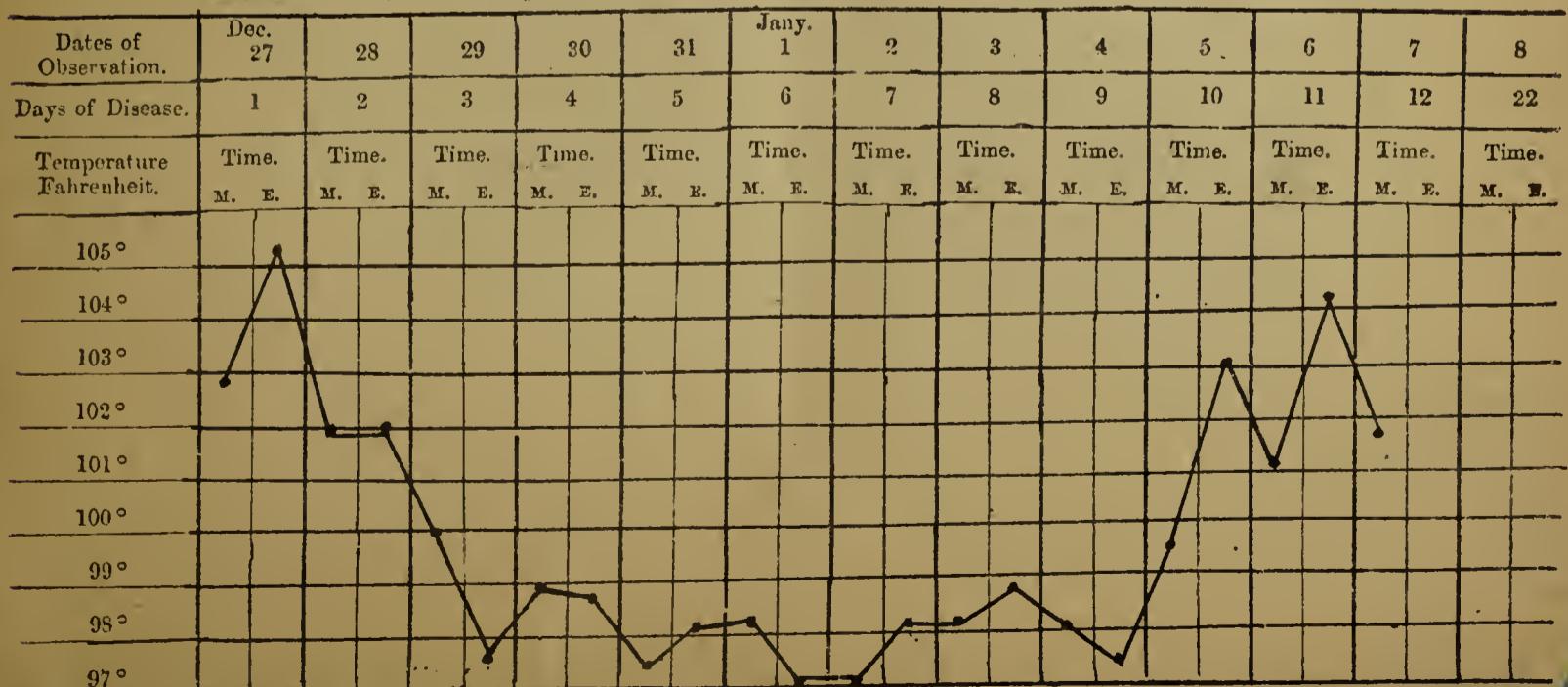
R. W. BURKE, V. S., A. V. D.

8th Hussars. No. A. 58—(Continued.)



R. W. BURKE, V. S., A. V. D.

8th Hussars. No. 30, C. B. Pony. Remittent Anthrax. Meerut; 27 Dec., 1886. Destroyed, 7 Jany., 1887.

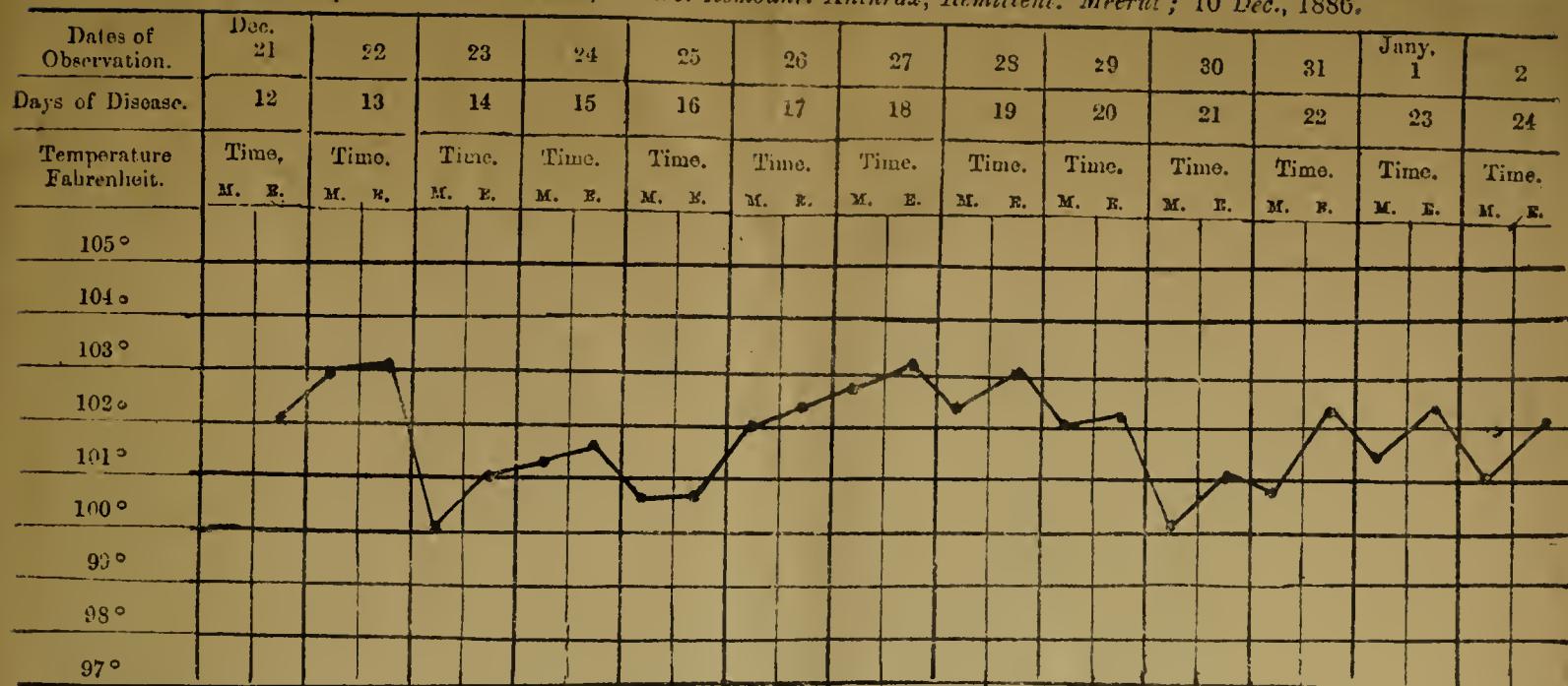


Petechial spots on the eyes, hurried breathing, cough, nasal discharge. Bacilli anthracis in blood examined on 1st day. Animal being down on the ground on the 6th January, 1887, was destroyed by order on the 7th idem. Note the morning remissions in the above charts.

R. W. BURKE, V. S., A. V. D.

RECORD OF TEMPERATURE.

8th Hussars. No. A. Persian, Entire. Remount. Anthrax, Remittent. Meerut; 10 Dec., 1886.

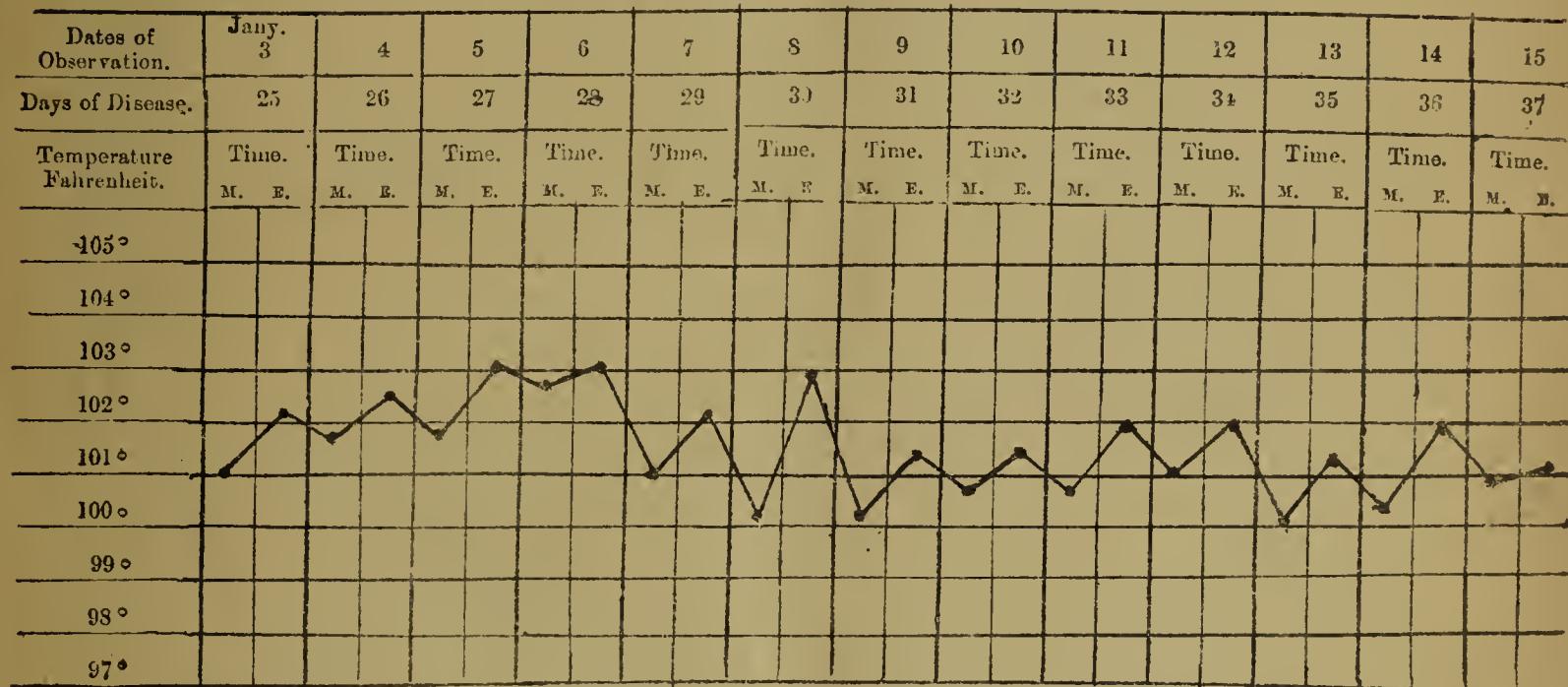


Case under treatment of V. S. ('st Class) C. Clayton, A. V. D., previous to my arrival on 29th Dec., 1886.

Itechial spots on membrana nictitans, and swelling of the throat, which was soft, fluctuating and migratory in character. Animal very dull, and favours the near fore limb since the 6th January; suffering from cardiac complication, and cough and nasal discharge since the 8th Jany., 1887. Note the morning remissions on the 23rd and 30th Dec., and 7th, 8th, 9th and 13th Jany.

R. W. BURKE, V. S., A. V. D.

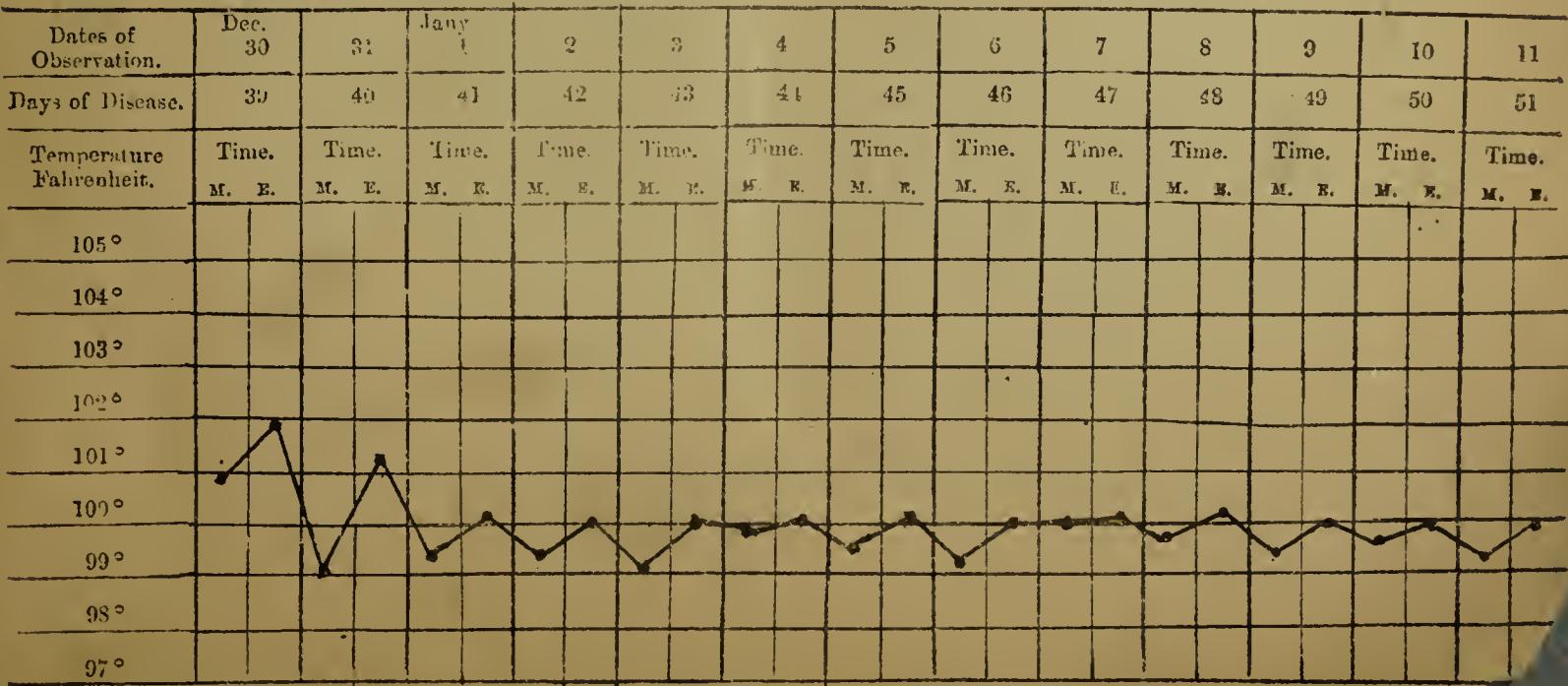
8th Hussars. No. A.—(Continued.)



Recommended to be destroyed, 20 January, 1887.

R. W. BURKE, V. S., A. V. D.

8th Hussars. No. 9, Pony. Remittent Anthrax. Meerut; 21 Novr., 1886. Well, 1st Jany., 1887. (



Case under treatment of T. S. Clayton, before 20 December, 1886.

Itechial spots on the membrana nictitans, extreme emaciation. Temperature, normal since the 1st January, 1887.

R. W. BURKE, V. S., A. V. D.



